1 Overview and Background on Community Engagement

Background

The nearby communities of Highlands, Channelview, and Baytown expressed concern overall about the urgency to remove contaminants from the San Jacinto River Waste Pits Site (Site) area and to clean up the contaminants of the earlier facility. They were also concerned about the effects on drinking water and nearby wells; the health impact from recreational use of the river; the consumption of fish from the waterway; and downstream issues. The EPA, in coordination with Harris County, began a series of informational meetings and formed a Community Advisory Group (CAG) that has met on a regular basis. There is a high level of community and elected official interest, including Congressional. The EPA has coordinated throughout with Harris County and local agencies, the Port of Houston Authority, the Texas Commission on Environmental Quality (TCEQ), and the Texas Department of State Health Services.

The EPA in cooperation with the State of Texas and county and local agencies will also continue moving forward to provide information on the status of the Site, community concerns, and Site repairs and maintenance moving forward. The EPA and its partner agencies will continue to update elected officials and community groups as needed, and provide site status updates on major Site developments as they occur.

Recent Public Participation

The EPA solicited comment on a Proposed Plan for the Site in early September 2016 and established a 60-day public comment period. The EPA held a public meeting, attended by 340 citizens on October 20, 2016, where comments, questions, and recommendations were recorded. The EPA then extended the comment period an additional 45 days. The official public comment period ended on January 12, 2017. Extensive comments were received in varying formats, including mail, online, and email, as well as verbal during the public meeting.

Responses to the Proposed Plan included over 7,000 individual comments and 48,000 signatures on various petitions.

Site Community Engagement

From the onset, after the Site was proposed and added to the National Priorities List in 2008, activities to inform the community began. A boat tour of the Site area was provided by a state agency for a Harris County Judge. The Judge called for action to assess and begin efforts to plan for cleanup.

Under the Agency's previous Community Engagement Initiative, the San Jacinto Site was included with other high profile sites as a potential CEI project calling for enhanced public outreach.

The EPA, in coordination with the Harris County Attorney's office, formed a group known as the Community Awareness Committee to meet regularly and represent local community

interests. Membership included representation from the Port of Houston Authority, Harris County, Galveston Bay Foundation, San Jacinto Coalition, Texas State Department of Health, Texas commission on Environmental Quality, Houston-Galveston Area Council, the County Commissioner, the Potentially Responsible Parties, and EPA. The group began a series of quarterly meetings over the next several years to discuss Site issues and how to keep the public informed.

The group initially determined that a survey was needed to assess neighborhoods and their health and safety concerns. The Potentially Responsible Parties assisted with local outreach concerns, in cooperation with the Community Awareness Committee, to undertake an area survey of residents, local small businesses and officials on their concerns about fishing and use of the waterway. State and county health departments were also closely involved throughout in door-to-door surveys to provide information and answer questions. These concerns were responded to in frequent agencies' community meetings.

Early on in the process the EPA conducted an innovative "World Café" style meeting for residents to encourage dialogue, exchange ideas, and discuss concerns among themselves and agency officials. Over a hundred citizens participated in this early-on Conflict Prevention Resolution-style meeting.

Other Community Outreach and Public Participation

The EPA's Technical Assistance Grant (TAG) was also awarded in May 2011 to the Galveston Bay Foundation to study and interpret Site data for the community. The TAG also worked with agencies, including state and local health agencies, and participated in all Site community group meetings.

Throughout the cleanup process, the EPA in coordination with state, county, and local agencies conducted regular, well-attended Open Houses, professionally facilitated community meetings, and elected official briefings as necessary. These events were communicated to the public by online websites, extensive mailing lists, and newspaper public notices in the Houston Chronicle, Highlands Star-Courier, and Baytown Sun.

Other established local community groups including the San Jacinto Coalition and Galveston Bay Foundation provided their own frequent community meetings to provide information to residents on Site activities and to address their respective agendas concerning the Site cleanup. The Region continues to get frequent calls and questions from residents about the status of the Site's cap, as well as ongoing Houston area media calls about Site issues and what's next for the Site.

The Agency in cooperation with Site cleanup partners and local stakeholders will continue to provide timely and supportive community outreach and public participation with the completion of the ROD in late 2017.

2 Comments from the Public and Responses

This section provides summaries of significant comments received during the public comment period and responses to those comments. This document breaks out comments into the following sections

2.1 – Support for Removal
2.2 – Support for Containment
2.3 – Risk Assessment
2.4 – Policy
2.5 – Cap Characteristics
2.6 – San Jacinto River Characteristics

2.1 Support for Removal

EPA received over 7,000 written comments and 48,000 signatures on petitions from individuals in the surrounding communities, various regions of the United States, foreign countries, school age children, elected officials, industry, industry associations, and non-governmental organizations. The comments from local residents generally support removal and off-site disposal, with over 94% of the comments received during the comment period voiced support for removal of the waste material.

The most common comment was associated with the long-term positive effect the removal of the waste would have on the surrounding communities and the San Jacinto River. Commenters indicated a concern about future hurricanes and flooding that a permanent cap could be exposed to if left in place over the next hundreds of years and the potential for the integrity of the cap to be breeched and cause a release of the waste to the river and surrounding land areas. The following comments cover the range of comments received.

2.1.1 Comment: The EPA's Preferred Remedy is the only method to ensure the residents of our county and region are protected, long-term, from the dioxin and other chemicals in this Site. Significantly, this EPA proposed plan for removal has unanimous local bi-partisan Congressional support.

Response: *EPA appreciates the support of Harris County and the Congressional members. In addition, removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.1.2 Comment: Keeping the dioxin under a cap would continue to endanger all communities affected by the river and Bay waters. The temporary cap has failed repeatedly with a large hole discovered last December. The maintenance and repair program that was part of the Time Critical Removal Action did not ensure containment within the cap and a sample containing a staggering level of the most dangerous dioxin was found outside the cap immediately after the hole was discovered. The cap failed. Let me repeat myself – the cap failed.

Response: *Documented events have shown that the current cap has suffered repeated damages and deficiencies from floods that were less than a 100-year flood event, even though the northern impoundment was designed for a 100-year flood. Repairs to the cap have been performed in July 2012, January 2013, January 2014, December 2015, February 2016, March 2016, and June 2016 since its completion in July 2011. The goal of the selected removal alternative is to eliminate the potential of an enhanced cap being breached and releasing contaminated material into the environment.*

2.1.3 Comment: Beyond the current problems, the current cap or a permanent cap can be severely damaged if it were hit by a barge or torn open by a major storm. The damage that would result could pollute the San Jacinto River and Galveston Bay for the next 700 years. The US Army Corps of Engineers analysis concludes that a strike will eventually occur. This failure is not a matter of "if"' but "when." The potential pollution is almost too big to comprehend. If we leave the waste in place, we could have a severely polluted river and bay for the next 7 centuries.

Response: *The US Army Corps of Engineers does report that barge strikes can pose the potential for contaminant loss. The predicted contaminant loss is low but EPA is concerned with any loss no matter the size. The US Army Corps of Engineers report is for one barge strike when there is the potential for simultaneous multiple barge strikes based on the number of barges staged upstream in near proximity to the Site. The removal of the waste as identified under Alternative 6N will eliminate the concern of a release associated with a barge strike and will be more protective in the long-term.*

2.1.4 Comment: I think the only reasonable solution to the dioxin placed in the San Jacinto River between Highlands and Channelview is total removal. That is the only way that we can ensure that future generations of kindergarteners are not exposed to this poison.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.5 Comment: When Hurricane Ike struck there were barges on top of I-10. The barges were removed. Can you imagine huge barges floating on I-10? The wind and force were so severe that a person who lived across the river on the far bank adjacent to the waste Site is still looking for his grand piano. This is a story of the force of nature in this area for those who live far away. To think we have waste under a rock in this pathway is beyond belief.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA is also very concerned about the potential extreme weather conditions be it flooding or hurricane events. It is not a matter of if but when the Site will be impacted by an extreme weather event.*

2.1.6 Comment: The health effects have been heartbreaking. Every female my age in the neighborhood we grew up in is dead of cancer. These women under 65 years of age. These are good, law abiding, very hard working citizens of this area. They deserved more. To see the warning signs of contaminated fish can bring a tear. What is worse is to see families with small

children fishing with these contaminated fish signs literally under their cooler. These caught contaminated fish are being placed in coolers. If approached they say with embarrassment "we are not eating them". Then why the coolers? Then to see small children swimming and wading in waste water areas from the river is shocking. Children swimming in dioxin laced water in the state of Texas is again a disgrace, beyond belief. Barge workers working with chains from the river are being exposed daily for many times 8, 12 or more hours per day. Would you want that done to your family? Good people simply earning a hard living. I am asking you to remove this waste for good, no fixes. Money has been set aside for restoration. What a dream as probably not in my lifetime to see water skiing, swimming and fishing again.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.8 Comment: Restaurants and grocery stores are dependent upon seafood harvested from Galveston Bay, which is also a primary recreational area for greater Houston. It is incomprehensible that the EPA would allow these waste pits to continue to pollute this vital natural resource. This dangerous environmental problem has gone on far too long. These pits must be properly cleaned up as soon as possible (and not capped), without any further extensions.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.9 Comment: My correspondence today it to bring to light some very important topics that can be seen by anyone honestly looking at the Site, meaning you do not need a college degree, PHD, or Master's Degree to understand the complexities of the toxic dump sight. Removal is the only plausible course of action in trying to rid our homes of this
potentially deadly poison.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.9 Comment: Over the years since 2011 there has been a cap placed onto this deadly dump Site, and it has been breached or compromised many times since. That river, just like all rivers is alive, and it is also constantly changing. So by placing any type of "cap" over this Site, is accomplishing nothing more than creating an additional 50 years of maintenance, death, and destruction, leaving to our children and grandchildren the problems of responsibility of this catastrophe, that through actions would not set a good example of responsible stewards for them to follow.

Response: *The Time Critical Removal Action (TCRA) Cap was completed in 2011 and since its completion, documented events have shown that the current cap has suffered repeated damages and deficiencies from floods that were less than a 100-year flood event, even though the northern impoundment was designed for a 100-year flood. Repairs to the cap have been performed in July 2012, January 2013, January 2014, December 2015, February 2016, March 2016, and June 2016 since its completion in July 2011. The goal of the selected alternative,*

including removal, is to eliminate the potential of a cap being breached and releasing contaminated material into the environment.

2.1.10 Comment: The very hazardous toxins of the San Jacinto River Waste Pits need to be removed entirely, once and for all.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. Removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.1.12 Comment: Never in 30 plus years had I heard about toxic waste at the Site. Never once did anyone ever say Waste Pits. No one warned the public. No one ever secured the property to protect the public. It is like they just did not care about the public health or the environment. Just write it off and walk away. Now they want to cover it up and leave it to future generations. What would happen if I were to dump waste in your yard? You would expect me to clean it up. The waste pits are in my back yard; I expect them to clean it up. For over 30 years I recreated in the river with never a thought it could be hazardous to my health. For over 30 years I ate seafood from the river and never thought it would be bad for my health. Never when we rode all-terrain vehicles in the area of the pits did we think it would be hazardous for our health. This problem is not something I want to leave for the future. It needs to be cleaned up as soon as possible. In my opinion there is no other option. It is their mess they need to take care of it. Dig and haul it out of there and dispose of it properly. I fully support the EPA Proposed Remedy of full remediation of the San Jacinto River Waste Pits. There is no way a cap should be used to contain this toxic mess. The people that left the mess are spending big money to promote a cap for containment; the cap there now does not work, why anybody would think they can make one that will safely contain this toxic mess for the life of the dioxins. The idea of just cover it up and everything will be OK is just beyond my belief. Out of sight out of mind I guess is the thinking. What happens when it fails many years down the road and these companies have to be forced to repair a cap. They do not ~~don't~~ want to do anything now and they are legally being forced to by the EPA. What says they would not do an Enron and file bankruptcy and then who will be on the hook for this mess? If the waste is dug up and hauled off for proper disposal this will never become an issue. This is exactly what we need the EPA to require.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.13 Comment: There has been a permit application for a new barge terminal in the river just upstream from the pits. This terminal will handle many hundreds of barges a month passing by the pits. There already is a serious risk of a barge strike, now with increased travel of future barge traffic, the risk is even greater. This river will eventually be more heavily traveled with tugboats and barges with the expansion of the chemical plants north of the railroad trestle which will mean even more barge traffic. There are just too many risks with leaving the Waste Pits in the river.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. In addition, EPA does not have regulatory control over the placement of barges*

in the San Jacinto River. EPA will propose institutional controls to address ~~limit~~ barge traffic near the Site. These will include restrictions on dredging and anchoring to protect the integrity of the area. EPA anticipates this will be a permanent institutional control.

2.1.14 Comment: My neighbors and I are concerned about the weight of the added material of the cap forcing the toxins out from under any cap or destabilizing the side berms. I am really shocked that there were not soil samples taken from the last scour that had to be repaired. I cannot help but believe there were not any toxins in those holes escaping into the river. When you place anything heavy on mud it pushes out to the side of the weight. The cap as is and any further modification of it is a dangerous idea. There is no way that should be a permanent remedy. We need the EPA to hold the responsible parties to the highest standards.

Response: *The added weight of large rock being placed on top of the permanent cap identified under Alternatives 3N and 3aN is a concern relating to subsidence and the ejection of contaminated waste. This is one of the reasons that EPA has selected the removal of waste as a long-term solution versus the use of an engineered cap with no waste removal.*

2.1.15 Comment: Plans I have seen show three lane feeder street bridges and five main lane bridges in both direction, there is no room for that expansion with the pits remaining in-place.

Response: *EPA is not aware of any plans for the future expansion of I-10 in the area adjacent to the waste pits. However, over time, improvements to the I-10 bridge may be required. Future I-10 road/bridge expansion and the issues associated with a permanent cap being used may limit the expansion of I-10.*

2.1.16 Comment: In my personal opinion the only safe and secure way to take care of the Waste Pits is to fully remediate the Site and haul the toxins to a landfill that is designed to handle them. No way should they be left in the river. To build a coffer dam around the Site and dig it out is safest way to handle this situation. This can be done with best engineering practices without spreading anymore of the toxins than already have been. I understand the responsible parties are against this, they want the cheaper and less effective solution. They are there to make a profit and keep the stock holders happy and spending $100,000,000 or more to clean it up will hurt the bottom line. The cap they have now has needed many repairs over the 5-year life of it, how many repairs will it need in the life of a permanent cap? In 1994 the flood waters pushed over the east bound I-10 bridge, how well will that cap survive that kind of flood? I don't want to see what happens. I want it cleaned up and out of the river completely.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.17 Comment: Please remove the waste pits, capping is not the answer.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.18 Comment: The temporary cap in place continues to be problematic, with repairs being required in 2012, 2013, 2015, and 2016 along with the recent discovery of an eight-foot area of degradation found in July of 2016 as noted in the Anchor QEA report. This history of repeated compromises is more than upkeep inherent with the cap as the owners would like us to believe.

Response: *The responsible party has continually indicated the current cap is designed for a 100-year flood event but since its completion, it has required repeated repairs during flood events below the 100-year flood level. The EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated repair of damage can lead to the release of the waste material into the river and surrounding environment.*

2.1.19 Comment: The location of the pits makes it a ticking time bomb to destruction by storm surge as it lies in a tidally influenced waterway. The Severe Storm Prediction Education and Evacuation from Disasters (SSPEED) organization's annual report demonstrates that it is only a matter of time before the area that the Site exists on is inundated from storm surge again and the Site is compromised even further.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA is also very concerned about the potential extreme weather conditions be it flooding or hurricane events. It is not a matter of if but when the Site will be impacted by an extreme weather event.*

2.1.20 Comment: Ensuring proper safeguards are in place and removal with best engineering practices is no doubt feasible. In fact, it has been completed successfully at other sites to date. With proper planning and third party oversight of the removal operation it can be a success.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.21 Comment: I fully support and recommend the EPA's proposed plan of Alternatives 6N and 4S for the North and South pits, respectively.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.22 Comment: I have been involved with a lot of decades old pits, landfills and other efforts to store waste in a geologic environment. This Site is one of the most vulnerable storage attempts that I have seen. Geologists and engineers plan a pit, or landfill, to encapsulate waste in a stable environment, the waste is kept dry and any accumulated leachate is drained through a collection system—and to assure stability, the situation is monitored in several ways. Federal and Texas regulations would not permit the least innocuous garbage dump at this Site, much less this leak-prone, dioxin laden accident waiting to happen. Your investigations at the Site have consistently shown that this containment, immersed in the water of Galveston Bay, leaks—and repeated attempts to repair even the surface cover have failed.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.23 Comment: This Site is particularly vulnerable in several ways related to its location in the upper part of Galveston Bay where it is subject to both hurricane surge and San Jacinto River flooding. Regardless of whether or not these projects are ever accomplished, the fact remains that the San Jacinto Waste Pits Site is at the upper end focus of hurricane surge effects in Galveston Bay—a fundamental reason that your recommendation to remove the waste is wise.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA is also very concerned about the potential extreme weather conditions be it flooding or hurricane events. It is not a matter of if but when the Site will be impacted by an extreme weather event.*

2.1.24 Comment: I would like for the EPA to mandate and oversee the complete removal and destruction of the dioxin. Apparently, there is a process for destroying the dioxin. This deadly toxic bi-product should not be pushed off into someone else's back yard or made the responsibility of someone else's grandchildren as it has been handed to us.

Response: *The final management and disposition of the removed waste will be developed in the Remedial Design phase.*

2.1.25 Comment: The efforts to clean our waters are working. I've never seen the water on our beaches this clear before. Now it's time to move inward, focusing on the removal of chemicals, waste havens, and businesses focused on dumping in our lakes and rivers. Let it be known that I believe removal is the only option.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.26 Comment: There is flooding during tropical storms and hurricanes which would damage the toxic pit. The residents with wells have had to use bottled water for months. There are warning signs not to eat the seafood from the river. It's time to completely remove the toxic waste.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.27 Comment: Please remove the pits. Every time it floods it leaks and we are put in further danger. The responsible parties could not, would not, manage this Site responsibly for decades, can they be trusted to manage it for centuries to come?

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.28 Comment: Remove these waste pits from our area. This is not an acceptable way to treat waste, and it is clear the cap is not working and has failed. It will continue to fail and pollute the environment. We cannot continue to allow this to happen.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.29 Comment: I believe that removal of the waste from the San Jacinto waste pits is the only solution that will be permanent in the long run. As a resident of this area, I have seen firsthand the damage that can be caused by the floods and hurricanes that this area is regularly subjected to. Capping the pits will not work as no amount of planning or design will ever be able to account for everything that nature can cause over the long run. Engineering failures occur often when attempting to protect against the effects of nature as was catastrophically demonstrated when the levees in New Orleans failed during Hurricane Katrina, and, as some residents of the area will recall, the Fred Hartman Bridge had to be shut down for emergency repairs soon after opening due some of the cables snapping off from the combined effects of drizzle and a light breeze that none of the designers had thought could pose a problem.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.30 Comment: Leaving the waste in place will eventually result in a breach that would release far more toxins and do more damage to the environment than any attempt at removal could. I swam in the river and lived along the river. As a young person that suffered miscarriages and myself being born with a congenital heart defect, it is pathetic that this type of horrible deceit occurred in America. Personally, I am appalled that there is any other idea than a thorough removal and cleanup of the River and waste pit Site. If it costs 1 billion dollars to do it, so be it. The River should be cleaned and the waste removed. Everyone involved in the tragic contamination should be held accountable.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.31 Comment: Please remove the pits completely. This is the only sensible and permanent solution. This river and bay is Houston's natural playground, we do not have mountains, or white sandy beaches. We have the San Jacinto River and Galveston Bay for fishing and swimming and boating. Please for my kids' sake do the right thing and remove the waste. I am a geologist and the only thing Gulf Coast rivers know to do is to meander and move, they change direction and they cannot do otherwise. Time will see the river expose any waste pits left in the ground. The evidence for this exists underfoot in every direction you walk on the coastal plain. Complete removal is the only option available for anyone thoughtful about the environment.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.32 Comment: I support full removal of the toxins as it is the only pathway to restoring faith in water quality of our water wells; to insuring future generations of a resolved issue; and to maintaining future property values. Your continued support of complete removal is very much appreciated by all of the families who depend on water wells for our water source.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. Removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.1.33 Comment: Galveston Bay and its tributaries have suffered due to the release of dioxin from this Site and the major carcinogenic toxin threat continues today, with apparently growing risk through cap damage and the continual threat of barge traffic, rough and rapid river flood conditions, tropical storm surge waters, and hurricanes. Those who consume regional seafood face a clear and present danger to their health due to the presence of dioxin at dangerous levels in fish and crab in the parts of the Bay, the San Jacinto River, Buffalo Bayou/Houston Ship Channel and associated tidal waters. This source of dioxin needs to be removed so it no longer poses this significantly dangerous health threat to our region. Trying to cap the wastes in this location has already proven to be a very ineffective method, with multiple and extensive failures of this cap method from the initial installation through current inspections. The location is simply unsuitable for this method of simply trying to cap the highly carcinogenic waste materials at this location.

Response: *The responsible party has continually indicated the current cap is designed for a 100-year flood event but since its completion, it has had integrity issues during flood events below the 100-year flood level. EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated repair of damage can lead to the release of the waste material into the river and surrounding environment.*

2.1.34 Comment: The EPA's own Guidance for In-Situ Subaqueous Capping of Contaminated Sediments states that low-level, dioxin-bearing wastes can be capped and isolated in a low energy environment such as a protected harbor or low flow stream. The wastes in this pit are not low-level, and the San Jacinto River is not low energy, protected, or low flow. No one should try to permanently retain a persistent, toxic chemical, in a river, in this sort of environment. Keeping this waste contained would be a constant battle against the forces of nature, with continually cap failures and increased toxin leaks as have been documented via recent inspections at continually alarming numbers and frequency of findings.

Response: *The responsible party has continually indicated the current cap is designed for a 100-year flood event but since its completion, it has had integrity issues during flood events below the 100-year flood level. EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated repair of damage can lead to the release of the waste material into the river and surrounding environment.*

2.1.35 Comment: Hurricanes strike, floods rage, streams change course, waters rise, land sinks, and sediment moves will continue over time. This toxic contamination problem is ours to solve now, not one to pass on to our grandchildren. We have seen failures of too many man-made

structures over much shorter periods to trust this cap as a long-term viable solution, when it has in fact already failed repeatedly, leaking toxins possibly for years, until inspections have found and hopefully repaired the continual damage points.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA is also very concerned about the potential extreme weather conditions be it flooding or hurricane events. It is not a matter of if but when the Site will be impacted by an extreme weather event. The responsible party has continually indicated the current cap is designed for a 100-year flood event but since its completion, it has had structural integrity issues during flood events below the 100-year flood level. EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated repair of damage can lead to the release of the waste material into the river and surrounding environment.*

2.1.36 Comment: Neither of the original companies responsible for disposing of waste at this location exist 50 years after initial placement of the waste. So, we have to ask, who will repair this cap up to 500 years from now? Will we place the burden of future taxpayers? The cap, purportedly designed to withstand a 100-year flood, has had repeated problems in the short 5 years it has been in place. Despite these problems, those responsible now want to convince EPA that they can make the cap permanent by adding more rock. Instead of forcing future generations to deal with this mess, we need to take care of it now. Methods to safely remove the waste from the Site exist today, and safe removal of dioxin and other persistent organic pollutants has been successfully completed at other sites in the country, e.g. Cumberland Bay, Lake Champlain, Plattsburgh, NY; Housatonic River ½ Mile and 1½ Mile sections, Pittsfield, MA; and Lower Passaic River Phase I, near Newark NJ. Just like in those locations, we can solve this problem on the San Jacinto River right now.

Response: *The responsible party has continually indicated the current cap is designed for a 100-year flood event but since its completion, it has had integrity issues during flood events below the 100-year flood level. EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated repair of damage can lead to the release of the waste material into the river and surrounding environment. The removal of the waste material from the Site can be performed successfully through implemented best management practices and EPA oversight of construction activities.*

2.1.37 Comment: The companies argue that removing the waste from the Site is riskier than capping it in place. This is true if one uses the inadequate technology they analyzed in their risk assessment. We believe that by using the best available technology, e.g. cofferdams and sheet piling, the waste can be isolated from the river and safely removed, eliminating the problem for all time.

Response: *The removal of the waste material from the Site can be performed successfully through implemented best management practices and EPA oversight of construction activities. EPA is including the use of cofferdam and sheetpile walls to allow the Site to be totally removed in the "dry".*

2.1.38 Comment: I support the U.S. Environmental Protection Agency proposed removing the deadly dioxin-contaminated wastes from the San Jacinto River Waste Pits Superfund Site because removal is the only correct and permanent cleanup solution. Floods and hurricanes are common occurrences along the Texas Gulf coast and the only way to stop the seepage into Galveston Bay and the Gulf is to remove these poisons permanently. Seafood is harvested from the bay for human consumption. These toxins are not only a health hazard but also a disaster for commercial fishing and recreation industries. Please clean it up and out once and for all. Do not delay.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.39 Comment: I am in agreement with the EPA proposal to remove the contaminated soils. I am not in favor of further 'band aiding' this issue with remedies that will be subject to leaking or failure during floods, and removal should have been the option chosen several years ago. In reference to the southern plan, will there be a cofferdam or berms installed on the southern portion for dewatering and the removal of the soil? Also, the 19-month duration will expose potential for flooding; what precautions will be taken?

Response: *EPA is also concerned with a "band aiding" approach as a long-term solution and feels the removal of waste from the northern and southern pits is the most long-term effective measure to protect public health and the environment. The implementation of best management practices associated with the removal of the waste from the southern impoundments will be evaluated during the Remedial Design phase. Best management practices utilized during the construction period of the northern impoundment may include, but are not limited to, the following:*

- *Removal will be completed in stages or sections as appropriate to limit the exposure of the uncovered sections of the waste pits to potential storms.*
- *Cofferdams in addition to dewatering and removal in the "dry" will be used to reduce the re-suspension and spreading of the removed material.*
- *Waste material will be excavated in the "dry" behind cofferdams. An excavation dewatering and water treatment system will operate as needed.*

2.1.40 Comment: I agree with the proposed plan of full removal. I believe this is the best option that will protect our environment and the people in our community. This is long overdue, and the time is now to protect ourselves and future generations. Responsible parties should clean up the mess so that people will not have to suffer from higher cancer rates and health issues as a result of the toxic dioxin sludge just sitting in the river and contaminating the land and people in the area. Please take this seriously and understand that this is affecting people's lives. It's time to end this cycle and properly remove the waste from the San Jacinto River. We will continue to ensure this happens.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.41 Comment: My water source is a shallow well, only 50 feet deep, situated 32 feet above sea level. My water is pumped from the sediment layer only 20 feet below the Site, and not a deep aquifer. I used to fish and boat in the river until learning of the contamination. Now I am scared to even shower in this water, much less drink it. I still to this day see people fishing in the river on a daily basis even with all the warning signs in place. I feel it is imperative that the wastes be removed completely as the temporary cap has proven ineffective since implemented. I do not foresee this temporary cap lasting as long as the lifespan of the dioxins buried and abandoned in the river. The costs of maintaining and monitoring the cap for the next 750 years cannot be less than full removal. Living in this community for such a time, I have seen firsthand the ill effects on health in the people that live here. Many are sick, and many have died. I ask for full removal of the toxic waste pits.

Response: *Although sampling has indicated that Site contaminants have not impacted drinking water supplies; removal of the source wastes will prevent any possible future contamination from occurring.*

2.1.42 Comment: I totally support the proposed Cleanup Plan for the San Jacinto Waste Pits. I am a "downstream" resident and feel very strongly that this is the correct course of action. Just covering the Site simply pushes the problem to future generations. Keep up the good work!

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.43 Comment: I support the removal of all waste sites. We need these cleaned up so that the river may have a chance to heal. I understand there is risk involved but there is high risk involved in leaving them where they are as well. We must attempt to correct this dangerous error.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.44 Comment: I support the Proposed Plan which selects Alternatives 6N (northern waste pit) and 4S (southern waste pit) to remove these toxic wastes period and that uses the recreational fisher dioxin sediment limit of 30 ng/kg as the risk-based remediation goal to remove contaminated material.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. EPA is adopting the 30 ng/kg level for the northern pits, but the southern impoundment will remain at 240 ng/kg. The EPA is adopting a 30 ng/kg remediation level for the waste pits instead of the 200 ng/kg level presented in the Proposed Plan for several reasons. First, after removal the waste pits area will be in direct connection with the river and will be subject to the same potential exposure routs as the river sediment, which has a 30 ng/kg remediation level. Further, adopting something higher than 30 ng/kg for the waste pits area would require a protective cover over the residual materials; however, this cover would be subject to the same erosive forces that raised concerns about a permanent cap for containment*

of the entire waste pits area. Finally, adoption of the 30 ng/kg remediation level would negate the need to long term monitoring and maintenance of the waste pit area.

2.1.45 Comment: In my opinion the waste pits were a flawed design from their inception. Who in their right mind would ever place a toxic waste dump on the banks of a flowing river anyway? But that now has become a moot point, the question now is what do we do with it? Obviously, it is still on a flowing river bank and it will continue to leak poison into our water for the next 50 to 100 years, no matter what stop-gap measures are taken in the interim. Unless we want to continue the flawed logic of the original decision. We must remove it totally, completely and immediately.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.46 Comment: I support the EPA's plan to completely remove the dioxin-contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. The proposed plan will secure the long-term health of Galveston Bay and its many residents for generations to come. Thank you in advance for carefully analyzing the scientific evidence, reviewing historical documentation and heeding the community's overwhelming cry to eliminate this threat from Galveston Bay. Removing this threat says we are serious stewards of our state. It removes a dangerous source of toxins from potentially contaminating our entire Galveston bay and destroying the fishing, seafood and tourist based economy it supports. This Site has been a problem since I was a kid. It is time to stop ignoring it and get rid of it now.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.47 Comment: I support the EPA's plan to completely remove the dioxin-contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. Few estuaries on the coast of the south 48 states of the United States were as productive of marine life or provided comparable habitat. It has been abused for many years. The crowning blow would be a hurricane which loosen the contents of the waste pits into the San Jacinto. The Proposed Plan will secure the long-term health of Galveston Bay and its many residents for generations to come. Thank you in advance for carefully analyzing the scientific evidence, reviewing historical documentation and heeding the community's overwhelming cry to eliminate this threat from Galveston Bay.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.48 Comment: I support the EPA's plan to completely remove the dioxin-contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. The proposed plan will secure the long-term health of Galveston Bay and its many residents for generations to come. I believe that the total removal of waste will allow both pregnant women and children to be able to eat fish caught in this area without the fear of getting cancer.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. Removal of the waste pits will remove a significant potential source of dioxin from the river. However, the San Jacinto River fish advisory is in place for other contaminants that just dioxin, specifically PCBs (Texas Department of State Health Services, 2015). Furthermore, the University of Houston identified multiple other sources for contaminants in addition to the Site (University of Houston, December 2009).*

2.1.49 Comment: I was a resident of Smith Point for 21 years 1995-2015 and saw how the majority of people weren't aware of consumption guidelines. They are completely ineffective.

Response: *EPA in cooperation with other Federal, State, and local agencies have tried diligently to provide notice to communities in the surrounding areas concerning the fish consumption guidelines. This has been done through signage on and around the Site, public outreach literature, and through community meetings. It is EPA's and the State of Texas's intention to reach as many people as possible.*

2.1.50 Comment: Over the last 50 years I have seen a dramatic improvement to the Houston Ship Channel and the greater Galveston bay system. No longer do we see ships openly discharging waste and it appears that the days of industry waste being dumped into the bays have improved. There is a major noticeable difference in the water quality today in the entire bay system. That said, I want to thank you for your efforts in cleaning up the San Jacinto Waste Dump. This sight and the companies involve in creating it are one of the last remaining major projects that need to be addressed. I am a member of the Coastal Conservation Association Texas and I support the EPA's plan to completely remove the dioxin contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. The proposed plan will secure the long-term health of Galveston Bay and its many residents for generations to come.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.51 Comment: I support the EPA's plan to completely remove the dioxin-contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. Please do not let this plan become the victim of a delayed governmental process. The material needs to be removed sooner, rather than later to insure the health of the resource and the local inhabitants that continue being exposed on a daily basis.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community. The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process is very detailed and demanding and can take time to complete. EPA values your patience and understands your frustration.*

2.1.52 Comment: I support the EPA's plan to completely remove the dioxin-contaminated materials from the San Jacinto River Waste Pits Superfund Site in Galveston Bay. The health of Galveston Bay is critical to businesses and industries in Texas, particularly seafood and related businesses, recreation and sporting businesses and industries. A significant number of jobs depend upon good water quality in Galveston Bay. In addition, it's water quality is critical to the

Gulf of Mexico and its fisheries, both commercial and recreational. In the strongest terms, I urge complete implementation of the plan.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.53 Comment: I am a former U.S. Coast Guard officer with experience with CERCLA, RCRA, OPA-90 and other pollution response programs including management activities for this and five other Federal Regions, including dioxin disposal and remediation of several Superfund sites. I also have experience with those programs in this region in the private sector. The proposed removal plan is the best option.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.54 Comment: Harris County strongly supports the decision by the EPA to totally remediate the Site as a preferred alternative. We believe this is the only option that will ensure that area residents will be protected long-term from a catastrophic cap failure in the years to come. Additionally, residents far downstream along Galveston Bay also in Precinct 2 will benefit knowing that the bay is protected from the consequences of cap failure at this Site. The EPA decision has the unquestioned support and broad coalition of county officials. This includes all elected officials in key county departments such as Harris County Flood Control District, the Health Department, Public Infrastructure Department, and of course our county attorney's office which has led the way in this effort.

Response: *EPA appreciates the support of local elected officials and community leaders and looks forward to continuing our relationship to protect the long-term health of the San Jacinto River and surrounding communities.*

2.1.55 Comment: If the pits were removed, the risk to our health and our water resources is also removed. For five years capping the pits has been unsuccessful, so it's time for a permanent solution. The only permanent solution is to remove the pits. This would reinstate my peace of mind and hopefully my health and it is time for those responsible to become good stewards of our environment and rectify the mistakes of the past so we can have a future.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.56 Comment: For too long the communities of eastern Harris County have been put at risk by the hazardous material found in the San Jacinto Waste Pits Superfund Site. The plan presented by the EPA is the culmination of a decade of calls by community members and local officials to fully remove the waste and protect families and children from public health risks."

Response: *EPA appreciates the support of local elected officials and community leaders and looks forward to continuing our relationship to protect the long-term health of the San Jacinto River and surrounding communities.*

2.1.57 Comment: I along with Harris County, the Galveston Bay Foundation and the San Jacinto Coalition support the EPA's proposal to fully dredge the waste pits over permanently capping the waste because the plan adheres to federal law, which prefers cleanups that 'permanently and significantly' reduce contamination. Capping would provide a short-term solution that could fail in the case of a natural disaster or equipment malfunction or deterioration.

Response: *EPA appreciates the support of local elected officials and community leaders and looks forward to continuing our relationship to protect the long-term health of the San Jacinto River and surrounding communities.*

2.1.58 Comment: BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF BAYTOWN, TEXAS: Section 1: That the City of Baytown fervently supports the following U.S. Environmental Protection Agency's recommended remedies for the San Jacinto Waste Pits: 1. Alternative 6N: Full Removal of Materials Exceeding Cleanup Levels and Institutional Controls for the north area and the sand separation area; and 2. Alternative 4S: Removal and Offsite Disposal for the south area.

Response: *EPA appreciates the support of local elected officials and community leaders and looks forward to continuing our relationship to protect the long-term health of the San Jacinto River and surrounding communities.*

2.1.59 Comment: Looking at similar estuarine Superfund sites across the United States, the EPA required removal of the highest concentrations of contaminated sediment at all seven sites (Garland 2015). The community members of Harris County, just as anywhere else in the United States, deserve clean air, clean water and clean soil. It is time to fully remediate this once pristine and highly sought after river. The EPA's Proposed Plan is one that would allow the surrounding communities and ecosystem to sustain and flourish and not be subject to further contamination.

Response: *EPA appreciates the support of local advocacy groups concerning our proposed long-term solution to protect the community.*

2.1.60 Comment: I live on the river and the waste pits need to be removed to make our neighborhood and communities safe for the future.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. In addition, removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.1.61 Comment: It's time for the only permanent solution: full removal of the toxic waste pits!

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. In addition, removal of the source waste will eliminate the potential for a release to the environment and the creation of a large contaminated sediment site.*

2.1.62 Comment: This mess needs to be cleaned up, not covered up as it is now.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. In addition, removal of the source waste will eliminate the potential for a release to the environment and the creation of a large contaminated sediment site.*

2.1.63 Comment: Removal will ensure, once and for all, that these dioxin wastes no longer pose a threat to the San Jacinto River and Galveston Bay.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA shares your opinion that the removal of the waste will be a great start to a cleaner San Jacinto River and Galveston Bay.*

2.1.64 Comment: Complete removal is the only option to ensure the safety of all inhabitants and the environment. The extreme weather changes make storage in place highly unsafe.

Response: *The overwhelming majority of received comments agree that the removal of the waste pits is the most responsible remedy for long-term health of the environment and communities. EPA is also very concerned about the potential extreme weather conditions be it flooding or hurricane events. It is not a matter of if but when the Site will be impacted by an extreme weather event.*

2.1.65 Comment: EPA's CERCLA spreadsheet includes more than 100 sites, of which about half include contaminants with properties that can be considered similar to dioxins. The spreadsheet lists 18 sites with one or more of the similar contaminants, at which 50,000 cubic yards of material was, or will be, removed or otherwise remediated. EPA's site records illustrate that similar size remedial projects in waterways have been successfully performed.

Response: *The removal of the waste material from the Site can be performed successfully through implemented best management practices and EPA oversight of construction activities.*

2.1.66 Comment: The EPA's proposed cleanup plan, including the full removal of the toxic waste in the San Jacinto Waste Pits will further efforts in preserving, protecting, and improving water quality of the public water. In addition, the selected alternatives are the only ones that will adequately address the toxic waste dump in the San Jacinto River located in the center of on the largest metropolitan areas in the United States which is prone to hurricanes, tropical storms, flooding, and tidal surges.

Response: *The EPA concurs with your sentiments concerning the proposed Alternatives 6N and 4S. EPA is also concerned about the history of the Site being impacted by flooding and hurricane events, which are anticipated to continue in the future putting the Site at risk if the waste material is not removed from its current location.*

2.1.67 Comment: Between 2012 and 2016, flooding events and/or barge strikes appear to have caused damage to the San Jacinto Waste Pits temporary cap on multiple occasions, potentially exposing the river to additional waste. Despite that the cap was designed to withstand a 100-year flood, damage has occurred during much smaller storms.

Response: *Leaving the waste in place at the Site will continue to be susceptible to damage by future hurricanes and flooding events and allow the environment to potentially continue to be impacted by waste being released. The implementation of Alternatives 6N and 4S will remove this potential for further releases.*

2.1.68 Comment: There is a concern with digging up the waste and removing it because there is the risk that some waste will be re-suspended in the process. The concern with leaving the waste in place is that there is not guarantee that it will stay there; the pits in the area are highly susceptible to flooding and storm surge from a hurricane. Flooding has impacted the cap, and we know our area will be hit by a hurricane at some point.

Response: *With the implementation of best management practices during removal activities, the potential for resuspension of waste is greatly decreased and EPA will direct the responsible parties to develop proven best management practices to protect against this situation. EPA also agrees that the Site is susceptible to major weather events and that the potential exists for damage to a cap system and release to the environment over a long period. Removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.1.69 Comment: The EPA has concluded that removing the waste provides greater permanence and offers less risk that capping the waste in place forever.

Response: *The removal of the waste is the most reliable method to remove the potential for future releases to the environment for the Site.*

2.1.70 Comment: We must start thinking what is best for our future generations and full removal is a start.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.71 Comment: The history of repeated compromise to the current cap is more than just upkeep.

Response: *The current temporary cap is designed for a 100-year flood event but since its completion, it has had integrity issues during flood events below the 100-year flood level. EPA believes that a capping system without removal of the waste material will continue to be a maintenance issue and the repeated need for repair of damage can lead to the release of the waste material into the river and surrounding environment and the creation of a large contaminated sediment site.*

2.1.72 Comment: The EPA's own Guidance for In-Situ Subaqueous Capping of Contaminated Sediments states that low-level, dioxin-bearing wastes can be capped and isolated in a low energy environment such as a protected harbor or low flow stream.

Response: *The San Jacinto River and the location of the pits is not located in a low energy environment. The San Jacinto River is dynamic and has been documented to abruptly change its flow paths. This has been dramatically shown after the 1994 flood by the creation of new channels and riverbank erosion. In addition, bottom currents can generate shear stresses that can act on the cap surface and may potentially erode the cap. In addition to ambient currents due to normal riverine or tidal flows, effects of storm-induced waves and other episodic events can act on the structural integrity of a cap. The selected alternatives remove the waste from the river and eliminates the potential for a release from a containment cap which will be subject to the forces of the river and weather events.*

2.1.73 Comment: I agree with EPA that containment alternatives cannot be shown to reliably contain the waste over a long-term basis, subjecting the community to the continued risk of a catastrophic release of dioxin.

Response: *Upgrading the current cap will not ensure the containment of the waste on a long-term basis. Removal of the waste will eliminate the potential for a release to the river and downstream receptors.*

2.1.74 Comment: I understand there is risk involved with removal of the waste but there is a higher risk involved in leaving them where they are as well.

Response: *The risks associated with removing the waste can be mitigated through proper use of best management practices versus leaving the waste in place for the long-term.*

2.1.75 Comment: I applaud the EPA for this recommendation and strongly support a full cleanup of this dangerous waste dump site.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.1.76 Comment: Dioxin is a serious problem for human health and the environment and should be removed and hauled to a permanent location where it is safely contained.

Response: *The Proposed Plan calls for the safe and managed transportation of excavated waste from the Site to a permitted landfill that is authorized for disposal of the Site waste and has the necessary controls in place to ensure that the waste is safely disposed of.*

2.1.77 Comment: This has been a continuing problem and worrisome for all who live near the San Jacinto River and we want it taken care of.

Response: *The selected alternatives identified in the Proposed Plan will be the first step in rehabilitating the area and is the long-term solution.*

2.1.78 Comment: My neighbors and I are concerned about the weight of the added material of the cap forcing the toxins out from under any cap or destabilizing the side berms. When you place anything heavy on mud, the mud is pushed out.

Response: *EPA shares your concern on adding weight to the cap as described in Alternative 3N. During the 2015 cap inspection, the identified damaged area was not underlined by geotextile material and rock was found to have sunk several feet or more into the waste material. This occurrence points to the need to carefully consider the load bearing capacity of the waste, especially with the potential addition of weight from the addition of several feet of larger armor stone over much of the cap.*

2.1.79 Comment: The Steering Committee of the Gulf-Houston Regional Conservation Plan herein supports the EPA's Proposed Plan for Clean Up of the San Jacinto Waste Pits Superfund Site.

Response: *EPA appreciates your support of our proposed long-term solution to protect the community.*

2.2 Support for Cap Containment

EPA received over 200 comments from the Potentially Responsible Parties, industry, industry associations, professional organizations, non-governmental organizations, and individuals in the surrounding communities and various regions of the United States voicing their disagreement of the proposed Alternative 6N (Removal of Materials Exceeding Cleanup Levels, Monitored Natural Recovery, and Institutional Controls) for the northern impoundments and aquatic Alternative 4S (Removal and Offsite Disposal with Institutional Controls) for the southern impoundment. The most common comment was associated with the concern of releases during the implementation of the proposed alternatives and the opinion that the construction of an engineered containment cap will provide long-term protection.

2.2.1 Comment: Keep it capped. The San Jacinto has too much of a propensity for flooding and storm surges to wash the toxins throughout residential homes in the surrounding area. Unending lawsuits would follow due to needlessly exposing citizens to toxins.

Response: *EPA disagrees with the idea of a permanent cap as the selected alternative for the Site. The San Jacinto River has a propensity for flooding and storm surge, which is why EPA's proposed alternatives of removal will be the most effective against future releases caused by potential weather events. In addition, removal of the source waste will eliminate the potential for a release to the environment and prevent the Site from becoming a large contaminated sediment site.*

2.2.2 Comment: I live on Highland Bayou just above West Galveston Bay. I want to voice my concern over the San Jacinto Waste Pits cleanup plan. From my understanding, your plan increases the potential risk for discharge and contamination downstream to the area of my home and the surrounding wetland and marine systems. I urge you to consider other alternatives, such as permanent replacement of caps to prevent further discharge.

Response: *EPA and the US Army Corps of Engineers have indicated that a potential small release of the waste material may occur during removal activities. These potential releases can and will be controlled through engineering control measures and best management practices. There is no guarantee that a cap or an enhanced cap can reliably maintain structural integrity for the long term that dioxin would remain toxic. The current temporary cap has required repairs multiple times in its short life due to relatively low-level weather events.*

2.2.3 Comment: Data collected in 2016 at Region 6's direction demonstrates the effectiveness of the existing armored cap. The test results unequivocally show the effectiveness of the existing armored cap. No target dioxin compounds were detected in porewater or groundwater, and the data show substantial decreases of dioxins and furans in surface water and sediment. These new data were provided to Region 6 prior to the issuance of the Proposed Plan, but were not considered in evaluating the effectiveness of capping alternatives.

Response: *Data from current sampling shows that waste is contained, except for surface water samples, which show an increase in dioxin adjacent to the waste pits compared to upstream samples. The EPA considered the results of these samples in assessing the current*

effectiveness of the cap and plans to assess the need for restructuring the current operation and maintenance plan. However, none of this sampling addresses the long-term effectiveness of the cap during severe storms and hurricanes because the sampling relates only to the ability of the cap to contain the waste under current conditions. It does not address the strength or ability of the cap to withstand storms or hurricanes in the future.

2.2.4 Comment: To justify the selection of Alternative 6N, Region 6 has mischaracterized routine cap maintenance, thereby presenting the existing cap as ineffective. The purposes of the existing armored cap were to stabilize the Northern Impoundments and prevent any releases to the environment. These purposes have been achieved. In fact, the existing armored cap has been effective in containing the waste material, as confirmed by extensive groundwater and porewater sampling, as well as surface sediment sampling performed adjacent to cap maintenance areas.

Response: *The continuing maintenance and repairs of the current temporary cap in the six years since construction, has showed no signs of lessening based on past issues with its structural integrity after being subjected to floods. Further, the maintenance and repairs performed was in response to relatively low intensity flooding, considerably lower than the design 100-year flood. This does not provide assurance that more significant cap damage will be avoided for the greater magnitude design storm or even more severe hurricanes and their associated storm surge and wave action effects. This is also documented in the riverbed scour which occurred in 2016 adjacent to the cap following less intense flooding below the design flood and does not give the assurance that greater undermining of the cap will be avoided with more intense flooding over time. EPA does recognize that cap maintenance may be accomplished following receding of flood waters or hurricanes to repair any damage to the cap; however, any dioxin release to the river would have already occurred. Finally, the cap area where the armor stone was found to have sunk into the waste in 2015 resulted in the direct exposure of the dioxin containing waste to the San Jacinto River.*

2.2.5 Comment: US Army Corps of Engineers and EPA cap design guidance expressly presumes that routine and event monitoring will identify the need for possible cap maintenance. Design guidance issued by EPA and the US Army Corps of Engineers recommends that "event-based" monitoring be used to fine-tune an operation, monitoring, and maintenance program as part of the monitoring of the performance of the cap following specific storm events. Typically, in the first few years following cap construction, there is a period where monitoring and maintenance practices identify and address areas of the cap that need to be enhanced, if any, so that the long-term protectiveness of the cap can be ensured. The maintenance that has occurred at the Northern Impoundments has followed this pattern with modifications made to the operation, monitoring, and maintenance plan as necessary. The Alternative 3aN enhanced cap, to be constructed with much larger rock, is designed to be protective during future extreme storm events and will reduce the need for future maintenance. The enhancements to the existing armored cap as part of Alternative 3aN were developed by the US Army Corps of Engineers. They include adding two feet of much larger rock to most of the cap, and adjusting slopes to increase their long-term stability. This step should reduce the need for future maintenance. According to the US Army Corps of Engineers, it also will be protective against erosion during future extreme events of the kind that Region 6 asserts raise questions as to the cap's long-term effectiveness.

Response: *The design guidance presumes the cap is performing as intended for meeting remedial action objectives and cleanup criteria. The event-based monitoring/repair after a potentially weather event would be reactive and not proactive. Damage to the cap would have already occurred. Any dioxin release to the river would have already caused impact and the response time for maintenance/repair would be delayed based on the timeframe for flood waters to recede and the ability to access to the cap by water or land. Alternative 3aN is a more robust design based on the use of larger rock but with the use of larger rock comes the potential for the cap to subside due to the weight of the larger rock which has the potential to cause structural failures and the release of waste to the environment. This has already occurred in 2015 with smaller armor stone.*

The Corps of Engineers has performed a model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event. The implementation of Alternatives 6N and 4S would eliminate these potentially cap failures and releases of waste to the environment.

2.2.6 Comment: The toxic pits need to be properly contained now, no matter who pays for this.

Response: *The use of containment measures to store the highly toxic and potentially mobile waste does not remove the waste from its current location within the San Jacinto River, whereas the selected alternatives in the Proposed Plan does. The removal of the waste material will provide the long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.7 Comment: Please safely contain this toxin as soon as possible.

Response: *The use of containment measures to store the highly toxic and mobile waste does not remove the waste from its current location within the San Jacinto River, whereas, the selected alternatives in the Proposed Plan does. The removal of the waste material will provide the long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.8 Comment: I support enhanced capping due to factors such as sediment disturbance, delayed natural recovery, potential exposure, and increase of concentration in fish.

Response: *There may be some releases during the removal phase of the selected alternatives but these releases will be minimal and controlled using engineering control measures and best management practices. The potential for releases from an engineered cap is a long-term risk given the uncertainty that numerical models and cap design have sufficiently accounted for effects of potential floods, hurricanes, storm surge, wave action, and subsidence associated with the design of the cap. The removal of the waste material will provide a reliable long-term solution to protect the community.*

2.2.10 Comment: I support capping due to factor such as river current, quantity, toxin decay, inadequate equipment, and no proof one remedy will yield better results than capping.

Response: *The reason the EPA has proposed removal is based on your mentioned factors. The river current (being the San Jacinto River is dynamic and will have changes over the next hundreds of years and its exposure to severe weather events) is one reason that removal is necessary instead of relying on a cap to sustain structural integrity for centuries. The quantity and toxic levels, as well as the slow rate of decay of the dioxin waste is also why removal is necessary. The waste can be properly removed and disposed in a facility engineered to safely contain wastes outside of a river environment where long-term risks of exposure to the environment and community prevented. The removal process design, which will include all equipment to be utilized and best management practices, will evaluate all available techniques to safeguard the removal process. The selected remedial action will produce better results than capping because it removes the principal threat waste from the environment and will provide the long-term reliability to protect the environment.*

2.2.11 Comment: To be credible, EPA's analysis of the risks associated with the enhanced cap needs significantly more robust technical demonstration and less unfounded assumptions.

Response: *Statements have been made by both the EPA and the Potentially Responsible Party concerning the stability of an enhanced cap. These statements are based on the expectant lifespan and structural integrity of an enhanced cap for hundreds of years to protect against the release of dioxin contaminated waste. Documented events have shown that the current cap has suffered damages and deficiencies from floods that were less than the 100-year design flood event. Repairs to the cap have been performed in July 2012, January 2013, January 2014, December 2015, February 2016, March 2016, and June 2016 since its completion in July 2011. The goal of the selected alternative, removal, is to eliminate the potential of a cap being breached and releasing contaminated material into the environment. The commenter indicates the plan offers an unsubstantiated opinion that future flooding may be more intense; however, the commenter does not offer an opinion or data indicating that future flooding will not be more intense and does not take into account sea level rise and other natural occurrences over a period of hundreds of years, which an enhanced cap will need to remain structurally sound. Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time frame that the dioxin waste would remain hazardous.*

2.2.12 Comment: Region 6 ignores evidence of the Alternative 3aN enhanced cap's effectiveness and has no credible basis for rejecting it.

Response: *The principal threat waste and the potential for release of dioxin containing waste is not eliminated as with Alternative 6N. Per the 2016 US Army Corps of Engineers' report, the most severe event simulated was the hypothetical synoptic occurrence of Hurricane Ike and the October 1994 flood, with a peak discharge of approximately 115,000 cubic feet per second occurring at the time of the peak storm surge height at the Site. The results during the peak of the storm surge showed that the sections using Armor A (3-inches diameter) were completely eroded, while the sections using Armor D (10-inches diameter) were eroded more*

than 12 inches in about 33 percent of those sections. The sections using Armor B and C (6-inches diameter) incurred a net erosion of more than 9 inches in about 75 percent of those areas. Overall about 80 percent of the cap experienced significant erosion with scour reaching approximately 2.4-feet through the cap and into the waste material. The cap used for this simulation has an upgraded design compared to the currently existing temporary cap. The scenario defined above may cause significant erosion of the paper mill waste. The Corps of Engineers also performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event.

The releases from catastrophic events can potentially be addressed by additional cap improvements, including upgrading the blended filter in the Northwestern Area to control sediment migration into the cap, upgrading the armor stone size to a diameter of 15 inches and adding 2 feet of additional armor stone over the existing cap across the waste pits to minimize the potential for disturbance during very severe hydrologic and hydrodynamic events. However, the uncertainty inherent in any quantitative analysis technique used to estimate the long-term (500 years or more) reliability of the cap is very high. The US Army Corps of Engineers report did not consider changing river conditions. New channels eroding during flooding as well as changes in channel cross section due to bank erosion, shoreline breaches, etc. during a high flow event caused by a major flood or hurricane is beyond the ability of existing sediment transport models to simulate. The US Army Corps of Engineers report does not fully account for local scour of the river bed immediately adjacent to armored cap where turbulent flow effects may exceed model predictions during floods, leading to rapid erosion and undermining of cap slopes. In addition, the report's evaluation of excavation and removal often focuses on risks which will be reduced and/or eliminated through use of best management practices.

In addition, EPA disagrees with the characterization of an ultra-extreme storm. History has documented between 1851 and 2004, 25 hurricanes have made landfall along the north Texas Gulf Coast, seven of which were major (Category 3 to 5) storms. Tropical Storm Allison, which hit the Texas Gulf Coast in June 2001, resulted in 5-day and 24-hour rainfall totals of 20 and 13 inches, respectively, in the Houston area, resulting in significant flooding. More recently, Hurricane Rita made landfall in September 2005 as a Category 3 storm with winds at 115 miles per hour. The storm surge caused extensive damage along the Louisiana and extreme southeastern Texas coasts. In September 2008, the eye of Hurricane Ike made landfall at the east end of Galveston Island. Ike made its landfall as a strong Category 2 hurricane, with Category 5 equivalent storm surge, and hurricane-force winds that extended 120 miles from the storm's center. With 25 landfall hurricanes being documented alone the north Texas Gulf Coast in a 153-year period, which is approximately one every six-years, it can be expected that additional large hurricanes will make landfall in the north Texas Gulf Coast between the time the cap is complete and the several hundred years that the waste will remain toxic. Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding, large waves, and storm surges.

2.2.13 Comment: The 2016 data demonstrate that the existing armored cap, which would be enhanced under Alternative 3aN in accordance with the US Army Corps of Engineers requirements, has effectively contained the waste.

Response: *Data from 2016 sampling shows the waste is contained, except for surface water samples which show an increase in dioxin adjacent to the waste pits. The EPA considered the results of this sampling in assessing the current effectiveness of the cap and plans to assess the need for restructuring the current monitoring and maintenance plan, including potential cap improvements to address any continuing releases of dioxin from the waste pits to the surface water. However, none of this sampling addresses the long-term effectiveness of the cap during severe storms and hurricanes because the sampling relates only to the ability of the cap to contain the waste under current conditions. It does not address the strength or ability of the cap to withstand storms or hurricanes in the future.*

The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event.

2.2.14 Comment: Region 6 has mischaracterized routine cap maintenance as being unusual or unexpected, thereby presenting the existing cap (and Alternative 3aN) as being ineffective.

Response: *The damage to the cap occurred under conditions that are much less severe than the design flood conditions. EPA's concern is that the larger design 100-year flood, or flooding and/or wave action from a severe hurricane, neither of which has occurred in the short time since the cap was constructed, will result in more significant damage to the cap and will not result in a reliable containment remedy for the principle waste threat. Further, cap effectiveness concerns were raised when the cap area where the armor stone was found to have sunk into the waste in 2015 resulted in the direct exposure of the dioxin containing waste to the San Jacinto River. EPA guidance for long-term monitoring and maintenance of cap remedies presume the cap is performing as intended for meeting remedial action objectives and cleanup criteria; therefore, if repairs are required to address exposed waste materials where the cap has been removed, these requirements have not been met, and addressing these conditions would not be considered "routine cap maintenance". EPA agrees that routine cap maintenance is required to maintain remedy effectiveness for any cap, but this does not address EPA concerns for avoiding future releases of waste materials resulting from extreme weather events. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during an extreme storm event.*

2.2.15 Comment: Direction by Region 6 for reassessment of the armored cap design and construction even though the US Army Corps of Engineers November 2013 Reassessment confirmed the overall validity of the armor cap's design.

Response: *Even though the November 2013 US Army Corps of Engineers Reassessment Report found the 2012 cap was sufficient, much more extensive evaluation and modelling was performed. The evaluation and modelling showed that the cap with additional upgrades in addition to the 2012 upgrades (Alternative 3N) was still predicted to incur up to 80 percent erosion during a hurricane scenario.*

2.2.16 Comment: USEPA has exaggerated the potential benefits of the full removal and off-site disposal remedy (Proposed Plan) and underestimated potential harm to the environment during implementation of the remedy. The proposed plan offers the false hope of completely removing dioxins from the river and ignores the potential for a catastrophic release of dioxins during the potentially long and difficult construction period.

Response: *EPA and the US Army Corps of Engineers have indicated that a potential small release of the waste material may occur during removal activities. The potential release can and will be controlled through engineering control measures and best management practices. The removal of the waste material will provide reliable long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.17 Comment: The in-place containment alternative is the best solution for the San Jacinto River Waste Pits Superfund Site. It does not risk catastrophic impacts to the long-term health of the community and environment by digging into and trying to remove the highly-contaminated waste pits.

Response: *The only long-term alternative which reliably secures the Site from potential future losses is the removal of the dioxin containing waste material. There is no guarantee that the cap will maintain structural integrity for centuries and avoid future release of waste materials. The current temporary cap has required repairs multiple times in its short life due to lower-level weather events. Engineering control measures and best management practices will be employed to safely remove the waste.*

2.2.18 Comment: Because of the unique nature of this area (e.g., subjected to sub-tropical storm events and flash flooding) and the fact that the waste pits are submerged in the river, the full removal remedy is simply too risky. A catastrophic event during construction would cause significant, irreparable harm to the environment and the recreational and commercial fisheries.

Response: *During implementation of Alternative 6N, engineering control measures such as containment of removal operations inside cofferdams, best management practices, and placing requirements on the approach and schedule (e.g., excavation and dredging for removal of the waste will be done incrementally to avoid exposing the entire impoundment surface, reducing the risk of release if flooding does overtop the protective barrier) will be employed to limit the potential for releases of waste materials; both which will be developed during the Remedial Design.*

2.2.19 Comment: After almost two years, the US Army Corps essentially agreed with all of the underlying scientific and engineering analyses used to select the in-place containment remedial alternative. Only a few weeks after the US Army Corps of Engineers report was released, EPA issued a proposed plan that called for the full removal, discounted or disputed the analysis provided by the US Army Corps of Engineers, and ignored or did not seek the advice of sediment remediation experts in the private and public sector.

Response: *EPA did not disregard the US Army Corps of Engineers report. As documented in the US Army Corps of Engineers Report, there is the potential for loss of waste due to barge strikes or weather events. The US Army Corps of Engineers evaluation and modelling showed that a cap with upgrades to the current temporary cap (Alternative 3N) was still predicted to incur up to 80 percent erosion during a hurricane scenario. In addition, the report's evaluation of removal considered risks associated with dredging, while the actual removal will be performed in the "dry" without dredging. EPA did seek the assistance in developing and selecting alternatives from outside sources and governmental agencies including EPA experts, the United States Geological Survey, and the US Army Corps of Engineers. The concerns of the community as well as the potentially responsible parties and their experts were also considered.*

2.2.21 Comment: Does the USEPA believe past performance of a hastily constructed interim remedy should be used as evidence to reject all in -place containment remedial alternatives?

Response: *The description of the temporary cap as "hastily constructed" is a poor characterization of the temporary cap. The cap was designed and constructed in accordance with relevant guidance, under EPA oversight, and was reviewed by the US Army Corps of Engineers several times following completion. However, it is appropriate to consider the performance of the temporary cap under that actual conditions experienced in the San Jacinto River. The fact remains that the temporary cap has required repeated repairs and has resulted in the dioxin waste coming into direct contact with the San Jacinto River. The removal of the waste material will provide the long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.22 Comment: The natural resources of the San Jacinto River and Galveston Bay are too important to conduct a full removal experiment that is not expected to make things significantly better and could very well make conditions significantly worse. For the safety of our community, the armored, in-place containment remedial alternative should be selected as the preferred remedy.

Response: *Description of the cleanup action as an "experiment" is a poor characterization of the selected remedy. In fact, a successful precedent for removal of dioxin waste materials in a tidal river system using robust engineering control measures has occurred with the Passaic River Phase I Removal Action. Additionally, dredging inside cofferdams within river systems has been performed for numerous projects. The removal of the waste materials will require sound construction practices based on remedial design incorporating appropriate engineering control measures and best management practices. EPA's selected alternative provides greater long-term protectiveness for the San Jacinto River and surrounding communities than a capping remedy because the waste will be removed from the river.*

2.2.23 Comment: The risks to the public, the environment, and the workers of a large-scale, mass removal remedy are large and consequences could be catastrophic.

Response: *During implementation of Alternative 6N, engineering control measures such as containment of removal operations inside cofferdams will be employed to control the potential for releases of waste. In addition, excavation for removal of the waste will be done incrementally to avoid exposing the entire impoundment surface and reducing the risk of release. These and other best management practices will be developed during the Remedial Design. Alternative 6N removes the waste material, thus eliminating the any issue of a failing cap.*

2.2.24 Comment: The hypothetical benefit of the full removal remedy is the purported elimination of all contamination, but this is unlikely to be realized and, in fact, this approach is likely to make conditions in the river worse for a considerable time.

Response: *The benefit of removal is not hypothetical and EPA does not imply that this alternative is designed to completely remove all dioxins from the river. The proposed selected alternative removes the waste material that exceeds the Preliminary Remediation Goal. This can be much more effectively accomplished by using excavation in the "dry" as opposed to underwater dredging.*

2.2.25 Comment: The in-place containment alternative has a more consistent track record of success and minimizes the risks associated with construction.

Response: *Subaqueous capping remedies have been implemented successfully for numerous sites, though the track record for long-term effectiveness and permanence for these sites is generally limited to 2 to 3 decades. Removal provides a long term reliability because there is no issue with potential storm damage and long term maintenance.*

2.2.26 Comment: The in-place containment alternative can be implemented quickly, eliminating the current risk of exposure.

Response: *The capping alternative does have a shorter construction timeframe but does not achieve the goal of safely eliminating the long-term risk to the environment and community. Implementation of Alternative 6N removes the waste and eliminates the long-term risk.*

2.2.27 Comment: The in-place containment alternative is more cost-effective, less disruptive to the community, and is consistent with the goals to protect human health and the environment.

Response: *The enhanced capping of the waste may be less expensive and less disruptive to the community, but results in a lower level protection to human health and the environment for the long-term. If the cap fails or if effective maintenance is not sustained over the future centuries during which many severe or extreme storm events are expected, the impact will be detrimental.*

As discussed in the Record of Decision, the cost effectiveness of the selected remedial action is dependent on its costs as well as its effectiveness in protecting human health and the environment. First, focusing on the northern waste pits and starting with costs, the estimated cost for the selected remedy in the Proposed Plan, Alternative 6N, is $87 million compared to $24.8 million for the capping Alternative 3aN, for example. These cost estimates employ a 7%

discount rate for future year costs applied to baseline year costs (un-escalated) in accordance with EPA policy so that the costs for various alternatives can be compared on an equitable basis. However, according to the current Office of Management and Budget (OMB) "2017 Discount Rates for OMB Circular No. A-94, Appendix C", dated December 12, 2016, the relevant discount rate is 0.7% for projects of 30 years or longer and for constant-dollar flows (inflation premium removed). The impact of using a 7% discount rate compared to a 0.7% discount rate is that future year costs have an increasingly reduced impact on total project costs so that costs in later years, and especially beyond 30 years, have essentially no impact on total project costs. For the San Jacinto River Waste Pits Site, the more appropriate discount rate to use for evaluating cost effectiveness is the current OMB discount rate of 0.7% because it more accurately incorporates future costs than does the 7% discount rate. Therefore, the total cost of Alternative 3aN is $80 million using a 100-year project life, $100,000/year annual operation and maintenance costs, and a 0.7% discount rate. The use of an annual operation and maintenance cost, as opposed to only the first two years as was done in the Feasibility Study, allows a more appropriate assessment of the costs associated with cap repairs, exposed waste, and repairs of riverbed erosion as has been experienced in the 6 years following completion of the cap, and also includes a provision for future repairs that may be necessary following hurricanes, which fortunately have not occurred since the cap completion.

Next, moving to Alternative 6N, the selected remedial action, the cost estimate has been modified somewhat in response to the public comments, namely to employ the use of a cofferdam and perform the excavation in the "dry" so that no material release is expected during the removal. The new cost estimate for Alternative 6N is $105 million as detailed in the Record of Decision. Therefore, comparing the costs for Alternatives 3aN and 6N, Alternative 6N is approximately $25 million, or 31%, higher total cost than Alternative 3aN.

Regarding cost-effectiveness, removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap, and will eliminate the potential for future environmental and human health impacts should a release occur. The cost of a future widespread sediment cleanup, as well as health impacts, resulting from a cap failure are related to the amount of material that would be released in a future hurricane or hurricanes, which is impossible to predict with any degree of certainty. However, the history of the need for repeated cap repairs, the exposure of waste materials, the riverbed erosion that occurred adjacent to the cap, all of which occurred during storms with much less intensity that the hurricanes to which the area is prone, do not support capping as a cost-effective remedy. The Selected Remedy, removal, is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials unlike capping, which would always be susceptible to a future release following a severe storm event, or due to a failure of maintenance over a period of centuries.

2.2.28 Comment: EPA has based its selection of Alternative 6N as the preferred alternative citing excessive concerns over containment approaches, while accepting the full removal alternative with hand waving to dismiss the downside of the removal approaches.

Response: *EPA understands that the removal alternative does come with short-term risks and those risks will be mitigated using engineering control measures, best management practices, controlled and incremental removal, construction oversight, and a robust removal design. However, removal does provide greater protection to human health and the environment for the long-term. The detailed design, schedule, oversight, health and safety, transportation, and final disposition of the wastes will be done during the Remedial Design phase.*

2.2.29 Comment: EPA dismisses the fact that a containment remedy approach can be designed and implemented at this Site to provide secure and permanent isolation of the waste.

Response: *EPA disagrees that the waste can be reliably secured and isolated in a containment remedy scenario for the San Jacinto River for the long-term given uncertainties of both extreme storm events and implications from these effects. The Site is in a dynamic river way, which is exposed to forces such as flooding, hurricanes, storm surge, wave action, and erosion. The current cap was designed to withstand a 100-year flood event and has required repeated repairs for floods with lesser intensity. The only reliable, permanent solution is to remove the waste.*

2.2.31 Comment: Alternative 3aN contains provisions that would ensure stability against very extreme events. This alternative was essentially dismissed by EPA for the same reasons they rejected Alternative 3N, even though 3aN is a significantly more robust containment alternative.

Response: *Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the storm event modeled. However, the modeling did not consider the impact of a larger Category 4 or 5 hurricane, which may occur during the long time-frame that the dioxin waste would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.32 Comment: The Proposed Plan indicates that the preferred remedy was selected based on the Final Interim Feasibility Study as supported by the US Army Corps of Engineers Report. But, the details on long-term effectiveness and implementability for the alternatives in both the Final Interim Feasibility Study and Proposed Plan were selectively cited from the US Army Corps of Engineers Report to support a removal alternative. In plain language, the Proposed Plan cherry picked statements from the US Army Corps of Engineers Report to support removal, while largely ignoring considerations in the US Army Corps of Engineers Report that clearly supported a containment alternative.

***Response**: The EPA considered the entire US Army Corps of Engineers Report, as well as all of the other available Site information, in determining the selected remedy using the CERCLA remedy selection criteria. The US Army Corps of Engineers report contains information on the shortcomings and strengths of all of the alternatives without providing a recommendation or preference for the selection of an alternative. Capping would yield very low short-term releases while leaving the potential for failure under extreme events or stream bed morphological changes as experienced in the past. Removal could also yield low short-term releases with the most stringent best management practices and eliminate the potential for failure in the future. Removal with less than the most stringent best management practices would likely yield considerable short-term releases, however that is not the approach to be used for the Site. In light of the risks posed by dioxin containing wastes, the preferred remedy considered these strengths and weaknesses of the alternatives in its selection of removal in the "dry" using a cofferdam to prevent short-term releases.*

2.2.33 Comment: In general, Alternative 6N is a very inefficient remedy. It has a much higher cost, much higher short term risk, significant implementation issues, and longer construction time.

***Response:** During implementation of Alternative 6N, potential releases can and will be controlled through engineering control measures and best management practices (excavation and dredging for removal of the waste will be done incrementally to avoid exposing the entire impoundment surface, reducing the risk of release if flooding does overtop the protective barrier), both of which will be developed during the Remedial Design. The placement of a cap system to contain the waste is also potentially catastrophic to the environment, community, and workers for a long-term period. Alternative 6N removes the waste material, thus eliminating the issue of a failing cap.*

2.2.34 Comment: Alternative 3aN holds significant advantages over Alternative 6N since it has no short-term impacts, a lower risk of a catastrophic release of dioxin, and no implementability issues.

***Response:** EPA understands that the removal alternative does come with risks and those risks will be mitigated using best management practices, controlled and incremental removal, robust remedial design with contingencies for flooding, and construction oversight. EPA disagrees that containment has a lower risk of a release of dioxins. Alternative 6N and 4S remove the waste from any potential situation of a release in the long-term. Remedial design will evaluate approaches that reduce opportunities for residual waste materials following removal, such as in-dry construction within a cofferdam. Containment of the waste through a cap system does not remove the waste so the potential for a release will be present for centuries. EPA also disagrees that there are no implementability issues with capping, given numerous factors for subaqueous caps that require consideration during remedial design, such as the added weight and geometry potentially resulting in waste material releases during construction, or from consolidation of underlying sediment expelling dioxin-contaminated colloids within porewater. Finally, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative*

3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event.

2.2.35 Comment: I recommend that EPA select Alternative 3aN for this Site. The Remedial Design for Alternative 3aN should include the appropriate evaluations and modeling to determine the cap armor design and containment features necessary to ensure long-term effectiveness and reliability to resist ultra-extreme flow events and forces associated with potential channel migration processes that may impact the Site.

Response: *Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.36 Comment: This US Army Corps of Engineers modeling effort was focused on the Alternative 3N cap (with a range of median stone sizes from 3 to 10 inches), and was designed to simulate the 1994 flood event. But EPA essentially raised the bar with respect to an extreme event as part of its decision to revise and complete the Feasibility Study.

Response: *The US Army Corps of Engineers Report found that the Alternative 3N cap suffered significant erosion over 80% of the cap with Hurricane Ike, which is a Category 2 hurricane, and the 1994 flood. A more extreme Category 4 hurricane, with its associated higher winds, storm surge, and wind driven waves, although not modeled, would be expected to produce even more damage and erosion to a cap. The goal of the remedy for the Site is to be protective of human health and the environment, among other things. While a 100-year flood is certainly an extreme event, the Site will likely be exposed to even more extreme storms and hurricanes over the centuries that the dioxin waste would remain toxic, and consideration of these more extreme events is necessary to assess the long term ability of a remedy to remain protective. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic.*

2.2.37 Comment: Implementation of Alternative 3aN is straightforward and holds the advantage of a shorter construction time as compared to Alternative 6N.

Response: *Although the implementation of Alternative 3aN holds some advantages, it does not remove the principal waste threat and does not provide for a reliable long-term solution to protect the community and the environment. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The*

results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.2.38 Comment: There will be residual sediments left in the lower horizons below the impoundments, even following waste removal. Alternative 6N calls for a capping remedy component for these residuals, and similar issues hold for this cap as for any of the containment alternatives. It therefore will not be the case that the waste material will be "permanently removed from the river" or that there is "no potential" for future releases.

Response: *EPA is lowering the remediation goal to 30 ng/k. By lowering the remediation goals, a significant portion of the dioxin is permanently removed from the San Jacinto River system. EPA is also modifying Alternative 6N for the selected alternative to include completely encircling the capped area with a cofferdam for "dry removal" to facilitate attainment of the 30 ng/kg level. This approach minimizes the amount of residual dioxin. Because the remediation goal for the waste pits area is now 30 ng/kg, which is the same level as for the river sediment, there is no need for a residuals cover.*

2.2.39 Comment: If EPA does not consider a containment alternative can reliably contain the waste for a 500-year timeframe, the same should be applied regarding potential releases from any off-site landfill where excavated material is placed. For this timeframe, there will be potential for releases and there will be issues for the effectiveness of a monitoring program for any off-site landfill. EPA completely ignores these issues in the Final Interim Feasibility Study and Proposed Plan.

Response: *A permitted landfill, if that will be the final disposition location, is not subject to the natural and manmade forces as a cap in a dynamic river such as the San Jacinto River. In addition, a permitted landfill is occupied daily by workers, monitored daily, and controlled daily whereas the cap is monitored on a highly reduced schedule.*

2.2.40 Comment: EPA's comparison of alternatives was pre-disposed toward removal as a remedy approach and so inequitably exaggerated the disadvantages of a containment approach and dismissed the disadvantages of the removal approach. EPA refers to the erosion modeled for Alternative 3N Upgraded Cap for the duel extreme event in the Final Interim Feasibility Study and Proposed Plan and associates this result with the Alternative 3aN Enhanced Cap. This is an unequitable comparison. EPA does this repeatedly, referring to the 80 percent erosion finding for Alternative 3N a total of 13 times in the Final Interim Feasibility Study and Proposed Plan.

Response: *The EPA considered all of the available Site information, in determining the selected remedy using the CERCLA remedy selection criteria. The US Army Corps of Engineers report contains information on the shortcomings and strengths of all of the alternatives without providing a recommendation or preference for the selection of an alternative. Capping would*

yield very low short-term releases while leaving the potential for failure under extreme events or stream bed morphological changes as experienced in the past. Removal could also yield low short-term releases with the most stringent best management practices and eliminate the potential for failure in the future. Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.2.41 Comment: EPA is willing to accept a mass release of 0.34 % of the dioxin mass from the Site during implementation of a full removal under Alternative 6N with best management practices to control releases. No allowable release for containment and 0.34% mass release for removal is an inequitable comparison.

Response: *Accomplishing the removal by excavating in the "dry" behind a cofferdam will greatly reduce the mass release. The 0.34% mass release stated in the comment was based on removal of a part of the waste material by underwater dredging, which is not a part of the final remedial action. The removal alternative does come with risks and those risks will be mitigated using engineering control measures and best management practices, controlled and incremental removal, construction oversight, and a robust removal design. The removal of wastes identified in Alternatives 6N and 4S remove the waste from any potential situation of a release over the centuries that the dioxin would remain toxic.*

2.2.42 Comment: EPA states in the Proposed Plan that Alternative 3aN Enhanced Cap does not include additional measures to reduce toxicity, mobility, or volume. But, by definition, a containment remedy does in fact reduce mobility of the waste. Alternative 3aN significantly reduces mobility through a robust cap design. Further, Alternative 3aN will reduce the volume of the waste as a result of consolidation under the additional load of an enhanced cap.

Response: *A robust cap may reduce mobility of a contaminant provided the site has stable environmental conditions. River and sediment bed conditions at this Site raise substantial questions regarding the long-term effectiveness of a cap. More specifics are provided below in the technical section dealing with capping comments. Alternative 3aN would not necessarily reduce the volume of waste because the material was placed under addition load. If in fact, the waste was further compressed it could be the result of voids in the material or expulsion of liquids. Compressing a void would not reduce the volume of material. Expulsion of liquids could result in a reduction of volume in place but dissolved and colloidal contaminants would be released as a result and enter the ecosystem. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur*

over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.2.43 Comment: EPA tries to take credit for reduction in volume under Alternative 6N simply due to the removal of the material. But, Alternative 6N Full Removal does not reduce volume, it simply moves volume from one place to another. In fact, there would be an increase in volume under Alternative 6N due to the stabilization treatment prior to transport and disposal in the landfill.

Response: *The dioxin contaminated material will be removed from the San Jacinto River system, and therefore the volume and potential in the river will be permantely reduced. The commenter correctly points out that the material will be moved to another location. However, the new location will be a permitted landfill with minimal exposure resulting in human and ecological risks. Landfills are more easily monitored and observed for corrective measures than an underwater location in a river.*

2.2.44 Comment: EPA commented in the Final Interim Feasibility Study on the cost-effectiveness of Alternative 6N with respect to releases, but this comment is a clear example of overreach in an attempt to justify a removal remedy. EPA states: "The cost of Alternative 6N ($87 million) is about 21 times more than the cost of the upgraded capping Alternative 3N ($4.1 million), but is about 3.5 times more than the cost of enhanced capping Alternative 3aN ($24.8 million). However, the potential future dioxin release for the temporary cap with the upgrades described for the Upgraded Cap (Alternative 3N) during a future severe storm results in a release of approximately 29% of the dioxin in the waste pits." (Final Interim Feasibility Study, p. ES-17). Use of such wording in the Proposed Plan is very frustrating. It is disingenuous of EPA to cite the release for Alternative 3N Upgraded Cap instead of the zero release for a properly enhanced and effective Alternative 3aN Enhanced Cap, and equally if not more disingenuous to tie that to a comparison of the cost of Alternative 3aN to Alternative 6N, and so implying that for 3.5 times the cost we avoid a potential 29% release. The comparison of the alternatives in the Proposed Plan, exemplified by the use of the tactics in the above examples, was inequitable and inconsistent with EPA policy as described in the EPA principles.

Response: *EPA believes there are a number of significant technical concerns which are discussed in section 2.5 below which are the primary reasons that capping is not the preferred alternative for a long-term effective solution. In certain environmental settings, capping is very effective. However, at this particular Site in the San Jacinto River system, this is not the case. So even though cost is a factor, the overriding reasons are related to the stability of the Site and the long-term effectiveness of the cap. Regarding cost-effectiveness, removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of*

the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.2.45 Comment: The selection of Alternative 6N Full Removal in the Proposed Plan is largely based on assumed ultra-extreme flow events or possible channel migration processes, perceived uncertainty surrounding such ultra-extreme events, and perceived uncertainty in the ability to design Alternative 3aN Enhanced Cap to resist such events. In reality, Alternative 3aN Enhanced Cap can be designed as a robust containment remedy which will provide long-term effectiveness and permanence in the face of such ultra-extreme events and processes.

Response: *Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic.* C*limate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time frame that the dioxin waste would remain toxic. The cap design uncertainty arises from the potential increase in storm intensity by an unknown amount over the centuries that a cap would need to maintain its effectiveness. The storm intensity uncertainty, coupled with the inherent uncertainties of the models used to predict the future performance result in a highly uncertain prediction of the ability of a cap to reliably contain the waste. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.46 Comment: U.S. EPA has inappropriately selected a remedy that requires an existing, approved and properly performing cap to be precipitously removed at great expense and with no incremental benefit.

Response: *Documented events have shown that the current cap has suffered damages and deficiencies from floods that were less than the 100-year design flood event. Repairs to the cap have been performed in July 2012, January 2013, January 2014, December 2015, February 2016, March 2016, and June 2016 since its completion in July 2011. Dioxin waste was actually exposed to the river in 2015. The goal of the selected removal alternative is to eliminate the potential of an enhanced cap being breached and releasing contaminated material into the environment. EPA understands that the removal alternative does come with risks, potential releases can and will be controlled through engineering control measures and best management practices, construction oversight, and a robust removal design. The removal of wastes identified*

in Alternatives 6N and 4S removes the waste from any potential situation of a release in the long-term. A containment of the waste through a cap system does not remove the waste so the potential for a release will be present for centuries.

2.2.47 Comment: Capping at upland sites, as well as at sediment sites, is a widely used and accepted remedial technology. In the context of contaminated sediment sites capping has been successfully used to manage contaminated sediments for more than 20 years. Experience has shown that, although a certain amount of monitoring and maintenance is required for any cap, capping technology is both safe and effective. In fact, we are not aware of any instance in which an armored cap, such as that currently in place at the San Jacinto River Waste Pits Site, has ever failed resulting in a release of contained contaminants to the environment.

Response: *After an extensive literature review, the U.S. Corps of Engineers found that there have been many occurrences of breaches and slope failures of armored dikes, jetties, and breakwaters, with some of those structures confining dredged material. The existing temporary cap was constructed as an interim measure to stabilize the waste pits until a final remedy could be developed. The cap has undergone a number of repairs that shows some of the weaknesses of containment. First, repairs were made on the western berm due to sloughing of the armor stone. Second, a 400 to 500-sq ft section of the cap failed, which exposed dioxin wastes in the Northwestern Area. This failure appeared to be caused by a bearing capacity failure from a poor filter layer and soft waste materials. Third, numerous locations in the Eastern Cell were repaired because the geotextile was exposed from apparent shifting or movement of the armor cap. Lastly, an area of scour nearly adjacent to the Eastern Cell was filled and armored from the edge of the cap to the outer limit of the scour hole. Additional riverbed scour is expected, and in fact occurred during Hurricane Harvey although the exact dimensions of this scour zone are unknown at this time. Consequently, the temporary cap is a less than secure containment. Further, The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.48 Comment: The maintenance activities between 2012 and 2015 cited in the Proposed Plan do not support the conclusion that the existing cap is inadequate. Over this nearly 5-year period, less than 0.6% of the cap surface area required any maintenance. The maintenance activities described on page 4 of the Proposed Plan depict minor and routine maintenance activities involving small areas of cap that appear to have been quickly corrected. Moreover, potentially responsible parties support enhancements to the cap as provided in Alternative 3aN. These enhancements would be expected to further improve cap integrity and performance, providing a large additional design safety factor. It is inappropriate to evaluate the performance of a capping alternative (Alternative 3aN), based on the performance of a cap that has not yet been fully constructed and armored.

Response: *There are environmental conditions that raise significant concerns regarding the long-term effectiveness of a cap, even an enhanced cap. This does not question the use of capping as a solution in other settings. EPA disagrees with the assertions in the comment, both considering the adequacy of the existing cap in the San Jacinto River system, and that repeated cap repairs can be defined as routine maintenance. In 2015, an area was discovered where the dioxin waste was directly exposed to the river. This performance does not improve confidence that the waste can be reliably contained for much more severe storms to come over a timeframe of centuries. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.2.49 Comment: The Principal Threat Waste Guidance was created "to streamline and focus the Remedial Investigation/Feasibility Study on appropriate waste management options", not to supersede or pre-empt the NCP's nine remedy selection criteria. The Principal Threat Waste Guidance focuses the scope of the preference for treatment, but is not a preference for removal and does not override the NCP's remedy selection criteria, as follows: "The selection of an appropriate waste management strategy is determined solely through the remedy selection process outlined in the National Contingency Plan (i.e., all remedy selection decisions are site-specific and must be made on a comparative analysis of the alternatives using the nine criteria). At this Site, the National Contingency Plan's mandatory criteria on protectiveness, short-term and long-term effectiveness, implementability and cost-effectiveness support an enhanced cap, as demonstrated by the Army Corps Report.

Response: *The EPA selected the remedy using the nine CERCLA remedy selection criteria contained in the National Contingency Plan, as discussed in the Record of Decision. The current setting is not suitable for the use of capping as a long-term solution because capping lacks long-term effectiveness under the conditions at the Site, i.e., repeated hurricanes over the long term. The US Army Corps of Engineers evaluation documents trade-offs between long-term and short-term risks of release. The selected remedial action will include best management practices for removal that include excavation under dewatered conditions behind cofferdams. In comparison, the current cap with enhancements as modeled by US Army Corps of Engineers experienced significant cap erosion over 80% of the cap. Performance of the Alternative 3aN cap is subject to a high degree of uncertainty as a result of its location in the San Jacinto River from hurricane storm surges, wind driven waves, etc. Furthermore, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the*

long term that the dioxin would remain toxic. The use of an armored cap will be inadequate to reliably contain the pulp waste over the long-term at the Site. Alternative 6N provides a more certain outcome than Alternative 3aN with lower overall potential for release.

2.2.50 Comment: USEPA should withdraw the Proposed Plan while it reconsiders the very significant implementability issues posed by the proposed remedy.

Response: *The implementability issues raised are not unusual for Superfund sites and have been addressed in the responses to other comments. The EPA does not plan to withdraw the Proposed Plan and further delay the implementation of the final cleanup of the Site.*

2.2.51 Comment: The closure in place represents not only a reduction in exposure risk to the area near the Site, it represents zero risk to communities and residents beyond the Site. It is imperative that anyone potentially affected by the proposed removal action or the associated material handling, transportation and disposal be informed of the risks associated with the movement from the Site to whatever final destination is selected of the estimated 152,000 cubic yards of contaminated material and the 13,300 truck trips that will required to affect the suggested Site closure.

Response*: Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

The Site remediation is required to meet applicable or relevant requirements and, as such, the waste and sediment testing and disposal will meet the standards required by State and Federal regulations. The spill plan, a standard component of a Superfund cleanup, includes a notification and response plan for any transport spills as well as contingencies to address spills, leaks and accidents. Transport vehicles will be lined, covered, or sealed to minimize losses during transport.

2.2.52 Comment: Neither Region 6's Feasibility Study nor the Proposed Plan demonstrated that the waste pit materials could not be reliably contained on-site. Rather, Region 6 substituted subjective judgment in ignoring containment cap engineering design and the large amount of information available from other sites where these remedies have been used in similar situations.

Response: *Capping is an acceptable remedy given the right environmental conditions. As discussed more fully in section 2.5 below there are a number of technical concerns which impact the long-term effectiveness of the capping solution. These concerns include the*

uncertainties of severe flooding, location in a dynamic river, adequate maintenance, potentially increasing storm severity over the centuries that the waste will remain toxic. The current cap with enhancements as simulated by US Army Corps of Engineers experience significant cap erosion over 80% of the cap. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.2.53 Comment: There is no underestimating the importance of engineering design on any containment remedy. On EPA's Clu-In website, Reible (2004) has noted that "Retention of contaminants for decades, centuries, or longer may be expected if the cap can be properly placed and retained over these time periods…It is likely to be feasible to design a cap to be stable under almost any hydraulic forces". This is as true for the Site as it is in general and it appears that Region 6 has given insufficient attention to engineering in evaluation of remedial alternatives. Most of the existing uncertainties in the containment alternatives are a matter of simple environmental and civil engineering practice that can easily be managed through the remedial design process that is implemented following issuance of the ROD.

Response: *EPA agrees that capping can be an effective long-term technology given the appropriate setting. However, the EPA is concerned that the current setting is not suitable for capping as a long-term solution for the dioxin contaminated waste materials. The inability to accurately know the intensity of future storms and hurricanes, which is projected to increase (Knutson and others, 2010), creates an unknown amount of uncertainty regarding the conditions to be engineered for. The current temporary cap was designed for a hundred-year flood, yet it has already, in less than five years, resulted in exposure of dioxin contaminated waste to the San Jacinto River following floods less that the design flood.*

2.2.54 Comment: Region 6 appears to assume without evidence that operation and maintenance (O&M) of the cap will fail and the Proposed Plan devotes a substantial amount of discussion to what Region 6 believes are failures in operation and maintenance. What Region 6 fails to recognize here is that operation and maintenance of any significant civil engineering project is a dynamic and iterative process. One would be hard pressed to find any major structural project in the U.S. that did not have modifications to its maintenance over years of operation as more information became known about the structure and its relationship to its environment. What is important is that there is a legal commitment to inspection and maintenance that evolves as time passes.

Response: *The maintenance of typical civil engineering projects does not involve the potential for exposure of the surrounding community on an abrupt basis to a highly toxic material before the need for maintenance may even be identified. The comment suggests that inspection and maintenance are the solution to all technical ills of a subaqueous cap. But this is*

not necessarily true. In 2014 the Interstate Technical and Regulatory Council published a guidance document which indicates site conditions that increase cap stability include deep water, low erosive forces including low flow, limited wave effects, and limited navigation related prop wash (Interstate Technical and Regulatory Council, 2014). The Site cannot be described as having low erosive forces and limited wave effects on a consistent basis. Further, the Site is in an active navigation area. During the past five years, the temporary cap has not demonstrated performance of a long-term stable nature. Similar to ITRC, EPA guidance for subaqueous capping identifies similar site conditions factors in selecting a capping remedy. Finally, maintenance does not address the concern that cap repairs following a release of waste materials is reactive after exposure of the environment and surrounding community have already occurred. This issue is not addressed through implementing a robust operation and maintenance approach.

2.2.55 Comment: Regardless of the exact releases, the best practice alternatives will result in adding complexity to a remedial alternative that is already highly complex. Increasing complexity breeds the probability of increasing failure. Given these and other related conclusions in the US Army Corps of Engineers analysis, there is little justification for selecting Alternative 6N in preference to Alternative 3aN.

***Response**: EPA disagrees that the proposed alternative is adding inappropriate complexity to a remedial alternative that is already highly complex. Removal of the material reduces complexity of the San Jacinto River Site over the long-term. Alternative 6N will remove the waste from the San Jacinto River, so there will not be a need for future maintenance as would likely be involved with Alternative 3aN. Further, there will be no concern that sometime in the future a severe hurricane will result in a abrupt release of highly toxic dioxin into the environment. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.3 Risk Assessment

This section includes comments regarding risk assessment. The most common comment was associated with the use of the biota-sediment-accumulation-factor (BSAF) from EPAs Combustion Guidance as opposed to site-specific BSAFs, the appropriateness of the fish ingestion pathway for the determination of risks and ultimately the Principle Threat Waste limit, and the determination of the Principle Threat Waste limit based on ten times the remediation goal established based on non-cancer dioxin and furan risks in lieu of cancer risks.

2.3.1 Comment: The U.S. Government including the National Institutes of Health and the EPA has not proved that dioxin is a hazardous material by the standards of the science on causation or by any ruling that met the tests for causation.

Response: *The contaminants at the Site include dioxin (specifically 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD), one of the most toxic members of the class of dioxins) and dioxin-like compounds (DLCs) (including polychlorinated dibenzo-dioxins in addition to TCDD), polychlorinated dibenzofurans, and polychlorinated biphenyls. These hazardous substances are structurally and toxicologically related halogenated di-cyclic aromatic hydrocarbons. Dioxin and DLCs are released into the environment from several sources, including industrial sources such as chemical manufacturing, combustion, and metal processing; from the bleached chlorine pulp at paper mills, from personal activities including the burning of household waste (backyard burning); and from natural processes such as forest fires and volcanoes. Dioxin and DLCs are widely distributed throughout the environment, and because they do not readily degrade their levels persist in the environment. As discussed further below, the type of dioxin most prevalent in the paper mill waste disposed at the Site is TCDD, unlike other, more widespread,"background" sources of dioxin such as diesel exhaust and backyard burning.*

The human health effects from exposures to dioxin and DLCs have been documented extensively in epidemiologic (human) and toxicological (animal) studies. TCDD is one of the most toxic members of this class of compounds and has a robust toxicological database. The USEPA thoroughly and publicly reviewed the toxicity of TCDD and published a reference dose (RfD) for TCDD in 2012 (EPA's Reanalysis of Key Issues Related to Dioxin Toxicity and Response to NAS Comments, Volume 1, EPA/600/R-10/038F, February 2012). The USEPA is not currently assessing the carcinogenicity of TCDD. The World Health Organization's International Agency for Research on Cancer (IARC) and the U.S. National Toxicology Program have both independently concluded that TCDD is a known human carcinogen.

EPA gathers evidence from a variety of sources regarding the potential for a substance to cause adverse health effects (carcinogenic and noncarcinogenic) in humans. These sources include controlled epidemiologic investigations, clinical studies, and experimental animal studies. Supporting information may be obtained from sources such as in-vitro test results and comparisons to structure-activity relationships. Taken together, EPA then develops a quantitative analysis and reports qualitatively the confidence in the study from which toxicity values were derived. In most cases one type of study does not provide conclusive evidence on its own, so researchers usually look at both human and lab-based studies and other supporting information when trying to determine if something causes cancer.

EPA recognizes that several epidemiological investigations involved Vietnam veterans. One of those studies was completed by the Centers for Disease Control, Atlanta, on U.S. Army Vietnam veterans who were likely to be exposed to the herbicide Agent Orange. Serum levels of TCDD, a toxic contaminant in Agent Orange, were obtained for 646 ground combat troops who served in heavily sprayed areas of Vietnam, and for 97 veterans who did not serve in Vietnam. TCDD medians for Vietnam veterans (median = 3.8 ppt) and non-Vietnam veterans (median = 3.9 ppt) were virtually the same. This study is consistent with later studies and suggests that most U.S. Army ground troops who served in Vietnam were not heavily exposed to TCDD. (JAMA 1988;260:1249-1254).

The EPA also looked at studies done on other groups of people: 1) herbicide manufacturing workers, herbicide applicators and farmers who often had much higher blood dioxin levels than Vietnam veterans; 2) people exposed to dioxin after industrial accidents in Seveso (Italy) and Germany; and 3) people after chronic exposures at work and in the environment. The EPA considered this information in developing its toxicity value for TCDD.

EPA followed the National Contingency Plan or NCP (a rule implementing the Superfund program) and other guidance in developing a site-specific baseline risk assessment for the San Jacinto River Waste Pits Superfund Site. EPA's selection of toxicity values for dioxin was based on EPA's December 5, 2003, directive Human Health Toxicity Values in Superfund Risk Assessments. This directive provides a hierarchy, based on best science available, of human health toxicity values generally recommended for use in risk assessments at Comprehensive Environmental Response Compensation and Liability Act (CERCLA, or Superfund) sites. The hierarchy consists of three tiers:

- *Tier 1. EPA's Integrated Risk Information System (IRIS) toxicity values*

- *Tier 2. In the absence of IRIS values, selection of EPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs). The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical specific basis when requested by EPA's Superfund program.*

- *Tier 3. In the absence of PPRTVs, selection of Other Toxicity Values, which includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.*

EPA selected a Tier 1 toxicity value as the reference dose for noncancer effects. The reference dose for TCDD is 7E-10 mg/kg-day (EPA's Reanalysis of Key Issues Related to Dioxin, 2012). The noncancer toxicity value for TCDD was based on two epidemiologic studies that associated TCDD exposures with adverse health effects. The first study reports decreased sperm concentration and sperm motility in men who were exposed to TCDD during childhood during the Seveso accident (Mocarelli et al., 2008), and the second reports increased thyroid-stimulating hormone levels in newborns born to mothers who were exposed to TCDD during the Seveso accident (Baccarelli et al., 2008). Adverse health effects were observed in sensitive

susceptible very young members of the population during their development in utero and identified the first 10 years of life as a critical window of susceptibility for TCDD induced sperm effects in young children. IRIS also gives the confidence level associated with the toxicity value. The degree of confidence ascribed to a toxicity value is a function of both the quality of the individual study from which it was derived and the completeness of the supporting data base. IRIS gave a confidence level of "High" to the non-cancer toxicity value for dioxin. Toxicity values published in IRIS are classified as Tier 1 toxicity values and are preferred over other classified tiered toxicity values.

Currently there is no cancer toxicity value or slope factor for dioxin published in IRIS. However, EPA requires whenever possible to evaluate chemicals for both cancer and non-cancer effects for chemicals that exert these types of effects. Dioxin is known to have both cancer and non-cancer effects. Therefore, EPA evaluated the risk from both types of adverse health effects in its site specific baseline risk assessment. Complying with EPA's Dec. 5, 2003 directive, EPA used a Tier 3 cancer toxicity value in its cancer risk evaluation in the site specific risk assessment. EPA used the California EPA Cancer Slope Factor (CSF) for TCDD of 1.3E+5 (mg-kg-day)-1 (at Cal EPA's 2002 Air Toxics Hot Spots Program, Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Sacramento, CA). As a result of its evaluation, EPA relied on the Tier 1 toxicity value for noncancer effects in its decision regarding the risk and cleanup development for the Site, but not the cancer effects of dioxin. EPA included a discussion of the cancer effects in its risk assessment to show that by cleaning the site to the non-cancer effects level, EPA is also protecting for cancer effects.

2.3.1 Comment: It is unclear if groundwater beneath the waste impoundments is protective of the Texas Surface Water Quality Standard (TSWQS) of 7.97E-8 ug/L for dioxins/furans (TCDD equivalents) as the detected concentrations in groundwater beneath the northern and southern impoundments was reported to be 2.64E-6 ug/L and 60.2E-6 u/L respectively. Additionally, the TSWQS for dioxins/furans (TCDD equivalents) is based on the total concentration of dioxins/furans in water. Total dioxins/furans concentrations include both dissolved and suspended dioxins/furans. Due to their hydrophobicity, low solubility, and low volatility, dioxins/furans in groundwater are expected to preferentially partition to suspended solids, including colloidal particles. The analytical results reported in the September 2016 Data Summary Report for samples collected using a solid phase micro extraction method only represents the concentrations of dissolved dioxins/furans and cannot be used to demonstrate compliance with TSWQS.

Response: *Removal of the dioxin waste will remove the source of dioxin contamination to ground water, while capping the waste will leave the source material in place. The sampling and analysis methods will be determined during the remedial design/long-term monitoring phase of the project. Both the total and dissolved fraction will be evaluated. The concentration of TCDD equivalents is not necessarily a direct correlation to surface water concentrations because surface water concentrations are impacted by other factors in addition to the ground water conditions. It is anticipated that the selected alternative would reduce dioxin/furan concentrations in groundwater directly below the impoundments due to removal of the source.*

2.3.2 Comment: It is unclear what the scientific/risk assessment basis is for the calculation of the Principal Threat Waste value, as well as what it means for cleanup at this Site. The Principal Threat Waste cleanup value is described as being calculated by multiplying the sediment Preliminary Remediation Goal (PRG) of 30 ng/kg by a factor of 10. However, there is no explanation of the reasoning behind the factor of 10. EPA should provide the scientific/risk assessment basis for calculation of the principal threat waste value. EPA should also explain how principal threat waste is to be used in the context of the other calculated PRGs for the Site.

Response: *The purpose of discussing Principal Threat Waste is not to set cleanup levels. The purpose is to reflect EPA's belief that certain source materials are addressed best through treatment because of technical limitations to the long-term reliability of containment technologies, or the serious consequences of exposure should a release occur. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include liquids and other highly mobile materials (e.g., solvents) or materials having high concentrations of toxic compounds. No "threshold level" of toxicity/risk has been established to equate to "principal threat." However, where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} ("A Guide to Principal Threat and Low Level Threat Wastes", Superfund Publication: 9380.3-06FS November 1991) or greater, generally treatment alternatives should be evaluated. EPA policy sets a precedent for defining principal threat waste based on a multiple of a risk based level. For example, waste demonstrating a carcinogenic risk of 10^{-3}. which is 10 times higher than the upper end of the acceptable risk of 10^{-4}, is considered a principal threat. Based on this precedent, the PRG of 30 ng/kg based on non-carcinogenic was multiplied by 10. Using a factor of 10 ensures that the waste could be released over the area of exposure with only limited dilution without causing exceedance of risk levels. The basis for the Principal Threat Waste value is included in the Record of Decision.*

2.3.3 Comment: Ultimately, the goal is removal of the fishing advisory in the area. The Toxicity Equivalency Quotient (TEQ) fish tissue Health Assessment Comparison (HAG) of 2.33 ng/kg is the value DSHS uses for dioxin fishing advisories. In review of EPA's August 29, 2016, Memorandum, "Human Health Risk Evaluation and Recommended Sediment Cleanup Level for Site Specific Exposure to Sediment at the San Jacinto River Superfund Site," the calculation of the sediment PRG of 30 ng/kg for dioxin is somewhat explained. EPA calculated PRGs individually for sediment ingestion, dermal exposure to sediment, and fish/shellfish ingestion, as well as a sediment PRG for fish consumption. EPA then calculated a total PRG associated with a hazard index of 1 from exposure to sediment through the ingestion of sediment, dermal contact with the sediment, ingestion of finfish, and ingestion of shellfish. The total sediment PRG is calculated to be 28.9 ng/kg, which EPA then rounds to 30 ng/kg. However, EPA does not provide the calculation for this PRG, so it is unknown how this final value was calculated from the individual PRGs.

Exposure Pathway	Calculated Non-Cancer PRG
Sediment ingestion	7.86E-4 mg/kg = 786 ng/kg
Dermal exposure to sediment	2.77E-4 mg/kg = 277 ng/kg

Fish tissue ingestion	3.13E-6 mg/kg = 3.13 ng/kg
Shellfish ingestion	7.3E-5 mg/kg = 73 ng/kg
Total sediment: ingestion, dermal, ingestion offish/shellfish	30 ng/kg (rounded up)
Sediment-to-fish consumption	35 ng/kg

The fish tissue PRG EPA calculated, which is used in the calculation of the total sediment PRG, is 3.1E-6 mg/kg, or 3.1 ng/kg. This fish tissue PRG is 1:33 fold higher than the DSHS dioxin fish tissue HAC of 2.33 ng/kg. Similarly, EPA uses the fish tissue PRG in the calculation of the sediment-to-fish consumption PRG of 35 ng/kg. By using a fish tissue PRG 1.33 fold higher than the DSHS dioxin fish tissue HAC, the resulting total sediment PRG and sediment-to-fish consumption PRG are higher than what would be needed to address the Site's contribution to the fishing advisory. In order to sufficiently address the Site's ongoing contribution to the fishing advisory in the area, the DSHS fish tissue HAC value for dioxin should be used. The TCEQ does not support actions/remedies that do not fully address the ultimate goal of allowing the removal of fishing advisories by DSHS (e.g., DSHS uses a Toxicity Equivalency Quotient fish tissue HAC of 2.33 ng/kg based on a hazard quotient of 1.)

Response: *One of the Remedial Action Objectives for the remedial action at the Site is to reduce human exposure to dioxins from consumption of fish. While the Site is a significant source of dioxin, it is not the only dioxin or PCB source (TMDL, University of Houston, 2006 & 2009), both of which contribute to the fish advisory. Because remediation of the Site will not affect the other sources in the San Jacinto River it cannot be expected that the fish advisories are likely to be removed.*

Development of the PRGs for the Site is described in the Record of Decision. Based upon the factor of 1.33 difference between the DSHS HAC and the EPA calculated PRG, both fish tissue concentrations would essentially result in a non-cancer hazard of 1, assuming only one significant figure (EPA 1989). The EPA calculated fish tissue PRG would not result in an unreasonable high sediment PRG. The selected sediment PRG is based upon the cumulative risk effects of ingestion, dermal contact, and ingestion of fish. BSAFs can vary quite significantly across the Site. Therefore, the 1.33 higher factor for EPA calculated fish tissue PRG is reasonable given the inherent uncertainty in the risk assessment process (e.g., fish ingestion rates, exposure durations, toxicity values).

2.3.4 Comment: The TCEQ requests that the EPA to annotate the tables provided under Human Health Risks section on pages 17 and 18 to include the meaning of the numbers in bold font. One might assume the bold is highlighting the numbers above the Hazard Index of 1, except that 0.11 is bold under the last entry for Scenario DS-5 in the table on page 18.

Response: *The Record of Decision will include the following corrections: the table on page 18 will be revised to remove the bold font for the HQ=-.11. A footnote will be added to denote the bold font identifies those exposure pathways with non-cancer hazards greater than the acceptable level of 1.*

2.3.5 Comment: Based on the Proposed Plan, it does not appear that EPA is planning to address the sediment areas outside the armored cap with dioxins/furans concentrations greater than the PRG of 30 ng/kg. Regarding the sediment cleanup areas, the following statement is made on Page 20. For the river areas outside of the armored cap, the surface area-weighted average dioxin concentration in sediment located just south of the waste pits (Figure 11) is 16.1 ng/kg, and the surface area-weighted average dioxin concentration in sediment in areas located adjacent to and upstream of the waste pits is 11.2 ng/kg. Because the average dioxin concentrations in sediment both upstream and downstream of the waste pits are less than the 30 ng/kg Preliminary Remediation Goal [PRG] for sediment, remediation of the sediment is not required. This seems in contrast with Figure 9, which shows surface sediment areas with concentrations greater than the 30 ng/kg PRG outside the armored cap. Also, Figure 11 seems to be referring to fish collection areas and tissue sampling transects and not the sediment. If the EPA is not planning to address areas with dioxins/furans concentration above 30 ng/kg outside the armored cap, please explain the rationale for this decision.

Response: *The rationale for not remediating areas outside the armored cap is explained in the Record of Decision. The PRG for sediment is based upon risk concerns. These risk concerns are evaluated over the Site as enumerated in the exposure point concentration (EPA 1989). Figure 9 in the Proposed Plan does show some sediment areas that are greater than the PRG of 30 ng/kg, however, when considering the overall Site, the sediment concentration, at 16.1 ng/kg, is significantly less than the PRG at 30 ng/kg. The assessment of the weighted average sediment concentration outside the armored cap is reasonable and consistent with the risk assessment. Notwithstanding the previous statements, the sediment in the Sand Separation Area will be addressed with Monitored Natural Attenuation as discussed in the Record of Decision.*

2.3.6 Comment: The abbreviation PRG was used in the document, but was not associated with the term "preliminary remediation goal."

Response: *Noted. The "PRG" used on page 12 of the Proposed Plan is an acronym for Preliminary Remediation Goal. This is clarified in the Record of Decision.*

2.3.7 Comment: EPA chose dredging of the northern disposal Site. In doing so, however, EPA did not consider the "short-term potential for adverse health effects from human exposure" and "the potential threat to human health and the environment associated with excavation, transportation, and redisposal" 42 U.S.G. § 9621(b)(1)(D), (G). The US Army Corps of Engineers specifically found that EPA's preferred dredging remedy (namely, alternative 6N) "would be expected to significantly increase short-term exposures to contaminants." Feasibility Study App. A Section 5 and the US Army Corps of Engineers specifically found that dredging under alternative 6N would have dramatically worse short-term impacts than the capping remedies. EPA failed to provide a reasoned justification for rejecting the USAGE analysis.

Response: *The US Army Corps of Engineers evaluation documents trade-offs between the long-term and short-term risks of release, both of which are dependent upon the effectiveness of engineering controls. The ability of Alternative 6N to control release is reliant on the ability of best management practices to control resuspension of sediments during removal. The Corps of*

Engineers Report, the Feasibility Study, and the Proposed Plan envisioned a removal based on a combination of excavation in the "dry", dredging behind a sheetpile wall, and dredging behind a silt curtain in the deeper water area at the northern part of the waste pits. However, based on consideration of the public comments received, and assessing the possibilities of performing the removal completely in the "dry", the selected remedy described in the Record of Decision consists of a cofferdam installation with excavation of the waste pits solely in the "dry", without any dredging. Therefore, the selected remedy will not result in a significant increase in short-term exposures as may result from underwater dredging. The selected remedy provides a more certain, quantifiable outcome than the containment alternatives, with a lower overall potential for release of mass.

2.3.8 Comment: The EPA indicated that the analytical results for dioxins/furans at the sand separation area may not be representative of the concentrations in that area and concluded that additional sampling may be necessary to obtain representative data. The TCEQ agrees with the EPA's conclusion and suggest collection of additional samples in the sand separation area, prior to issuance of the ROD.

Response: *Two samples over 300 ng/kg were found in the Sand Separation Area, but based on other samples the EPA does not believe these two results are representative of the area. The Sand Separation Area will be sampled during the Remedial Design to confirm the current sediment dioxin level as well as the limits of the dioxin affected area, and to establish a baseline for the Monitored Natural Recovery there. It is not appropriate to further delay the Site cleanup, as would occur if additional sampling was performed before selection of the Site remedy in the Record of Decision, given that the average dioxin level in the Site sediment, which is 16.9 ng/kg, does not exceed the sediment cleanup level of 30 ng/kg.*

2.3.9 Comment: The Proposed Cleanup Plan utilized a recreational fisher receptor to develop its Primary Remediation Goal (PRG) for the Dioxin Pits. The EPA based this decision on a 2013 Texas Department of State and Health Services (DSHS) risk assessment that "could not identify subsistence fishers in the area" of the Dioxin Pits. For the reasons set forth below, Harris County urges the EPA to include subsistence fishers in development of the Preliminary Remediation Goal for the Dioxin Pits. To do otherwise potentially exposes residents to unacceptable levels of dioxin.

Response: *EPA understands the concern set forth by Harris County. However, as noted in the comment, subsistence fishers were not identified in the area. The fish tissue PRG considers a child recreational user, which is identified as a sensitive population. The selected alternative will result in a reduction of potential human health concerns for all receptor populations in the area.*

2.3.10 Comment: Harris County researched cleanup levels for dioxins at other Superfund sites and requests the EPA order a cleanup of the Dioxin Pits that is consistent with these other sites. The three most recent sites are in tidal rivers where there is fishing activity (Diamond Alkali Lower Passaic River, Portland Harbor Willamette River, and Lower Duwamish Waterway). For the Lower Passaic River, the cleanup level for 2,3,7,8-TCDD is 8.3 ng/Kg. For the Willamette River, the site-wide cleanup level for 2,3,7,8-TCDD is 0.6 to 2 ng/Kg. For the Lower Duwamish

River, the site-wide cleanup level for Dioxin TEQ is 2 ng/Kg in the top 10 centimeters (cm) of surface sediment and 13 to 3 7 ng/Kg in the top 45 cm of sediment. Therefore, Harris County requests that EPA re-calculate the sediment PRG using the site specific BSAF values and considering subsistence fishing in the San Jacinto River. With these factors, we expect that a re-calculation of the sediment PRG would yield a value lower than the local background dioxin TEQ level of 7 ng/Kg in the San Jacinto River. Therefore, the PRG for this Site should be set at the local background level or below as ordered by the EPA at similar dioxin Superfund sites.

Response: *Background in the area has been found to range between 4 and 20 ng/kg. The human health risk assessment has demonstrated that the selected PRG of 30 ng/kg is sufficient to protect the most sensitive receptor (child fisher). EPA believes that remediation of the majority of the Site to the PRG will protect human health and the environment, yet provide an achievable goal.*

2.3.11 Comment: The Proposed Cleanup Plan does not provide for remedial measures to address contaminated sediment above the PRG outside of removal of the Site waste. The rationale for this is that when all surface sediments within the preliminary Site perimeter are averaged together, the average concentration does not exceed the PRG. This is concerning because it leaves several areas where contaminants mobilized from the Dioxin Pits are present at concentrations far in excess of the dioxin PRG (including, but not limited to the Sand Separation Area, the area west of the Dioxin Pits, and the area south of the South Impoundments as shown on Figure 2-8 of the Interim Final Feasibility Study Report). We recommend that these areas be remediated. Decisions on where to remediate should not be based on the dimensions of the preliminary site perimeter, but on the extent of actual contamination.

Response: *Risk associated with exposure to contaminated media are based on conservative measures of exposure. Reasonable Maximum Exposure (RME) concentration estimates were used across various areas of the Site, specifically a 95 percent Upper Confidence Limit of the Mean (95UCLM). In addition, a statistical assessment of the variability of Site COCs was used to establish appropriate exposure areas (Beach A, B/C, D, and E). Use of conservative estimates of exposure are consistent with guidance, and were utilized. Because statistical methods are used to estimate exposure (and resultant risks) it is not uncommon that some sample areas may have higher concentrations than the exposure point mconcentration, but exposure to these higher concentration areas are not expected to result in unacceptable risk, and consequently remediation is not necessary.*

2.3.12 Comment: I am concerned that residents have an unrealistic expectation regarding safe drinking water, river sediment, and tissue levels during their lifetimes post-excavation. I am curious if the EPA is forthcoming with estimates like these, if these estimates are unknown and incalculable, or if the truth would cause uproar and is therefore not being discussed.

Response: *Remediation of the Site will eliminate the dioxin source to the environment, consequently with achievement of a sediment remediation goal of 30 ng/kg risks in the river system will be protective of the most sensitive receptors. In addition, Long-term Monitoring (LTM) is required post excavation. Five Year Reviews (FYRs) will be conducted to establish if the remedial action has achieved the required level of protection. Consequently, if there were*

unexpected developments or the Remedial Action not successful the FYRs would document such an event.

2.3.13 Comment: Has there been testing of the water, soil, or fish in the surrounding area since the temporary cap was placed; and if so, what are those results?

Response: *Yes, sampling was performed post-cap placement, and the Baseline Human Health Risk Assessment (BHHRA) assessed risk post-capping as well as pre-capping. The investigation revealed that while the temporary cap has reduced exposure to the dioxin/furans in the area; the cap itself has required repeated repairs and maintenance beyond that originally expected. Further, a cap would most likely fail under an extreme weather event such as a major hurricane which have hit the area many times in the past. Consequently, the EPA has selected Alternative 6N which requires removal of the source material.*

2.3.14 Comment: We request that the EPA lower the Preliminary Remediation Goal for paper mill waste material to 30 ng/kg. This level is protective of recreational fishers and ecological risks. This would also be consistent with the EPA's Preliminary Remediation Goal for dioxin in sediment.

Response: *The PRG for paper mill waste was calculated based upon the results from the BHHRA which is risk-based and protective of the most sensitive potential receptors. Based upon the concentration of dioxins/furan in the paper mill waste, the selection of 30 ng/kg would not result in a significantly larger footprint of removal from the impoundments. The cleanup level of 30 ng/kg for the waste pits will be specified in the Record of Decision because the same route of exposure will exist for the waste pits area and the riverbed sediment, which is already 30 ng/kg, and because cleanup to 30 ng/kg will negate the need for a protective cover and its long term maintenance.*

2.3.15 Comment: We would like to ask what protocols will be in place to ensure the Preliminary Remedial Goal is met. We would like to request a conservative approach is taken with multiple split samples individually analyzed. The San Jacinto River Waste Pits are located in a tidally influenced waterway of high recreational use. The San Jacinto River flows into Galveston Bay, one of the most delicate and productive estuaries in the United States. Almost 30% of Galveston Bay's fresh water is supplied from the San Jacinto River. The San Jacinto River and Galveston Bay provide a unique habitat for a myriad of different species to spawn and flourish. Limiting fishing and crabbing in the immediate vicinity has proven difficult. Furthermore, the Waste Pits are in close proximity to residential properties and the nearby population is expected to double by 2040. The Proposed Plan states that the Pits will be covered with two layers of clean-fill after excavation of Principal Threat Waste. However, the River has immense erosive power and is subject to future flooding, storm surge, and wave action. It is not reasonable to predict that the clean-fill will serve as a protective measure of the waste material below 200ng/kg. The recent erosion on the eastern edge of the TCRA serves as an example of the unpredictable nature and force of the San Jacinto River.

Response: *As part of the development of the ROD and development/oversight of the remedial design, EPA will evaluate quality assurance measures designed to ensure that*

verification sampling is representative and demonstrates the level of protectiveness which will be identified in the ROD.

2.3.16 Comment: The Coalition supports the EPA's classification of the waste material in the Pits as Principal Threat Waste due to the waste being highly toxic and potentially highly mobile in future storm and flood events. However, we feel the EPA's calculation for the concentration of Principal Threat Waste to be arbitrary. EPA states that material at the Site with concentrations greater than 300ng/kg dioxin to be Principal Threat Waste. EPA calculated this by multiplying the Preliminary Remediation Goal of 30ng/kg by a factor of 10 (Proposed Plan, p. 10). The factor of 10 appears to be a simplistic way of coming up with a concentration and not a method which is based off of the best of science and cancer risk factors. For the above reasons, we strongly encourage the EPA to lower the Preliminary Remediation Goal and concentration classification for Principal Threat Waste. We understand that this request would require the Agency to consider remediation at the Upland Sand Separation Area. However, for the reasons stated above as well as the increasing nearby industrial activity, we feel this too is critical to the clean-up process and future of our environments and public health. We ask that the EPA require additional sampling at the Sand Separation Area as we are aware that this area has the "highest concentrations of dioxin outside of the Waste Pits" (Proposed Plan, p. 11).

Response: *EPA policy sets a precedent for defining principal threat waste based on a multiple of a risk based level. In specific, waste demonstrating a carcinogenic risk of 10^{-3} is considered principal threat, which is 10 times higher than the upper end of the acceptable risk range of 10^{-4}. Based on this precedent, the PRG of 30 ng/kg based on non-carcinogenic was multiplied by 10. Using a factor of 10 ensures that waste could be released over the area of exposure with only limited dilution without causing exceedance of risk levels. These points will be included in the Record of Decision.*

2.3.17 Comment: The risk assessments and public health assessment documents for this Site were based on theoretical exposure values tied to testing data. The risks shown in the Proposed Plan are based upon the Waste Pits being covered by the temporary cap. Despite this, beach E (the northern pit) presents an elevated risk of cancer (Proposed Plan, p. 17). Although the Proposed Plan is to remove the temporary cap in sections, this would temporarily increase the exposure risks. Therefore, we request further consideration for cancer risks. We believe a further consideration would lead the EPA to lowering the classification of Principal Threat Waste.

Response: *Goals based on non-cancer risks are expected to achieve reductions that would also address cancer risks. Temporary risks can be mitigated by best management practices, including removal in the "dry" behind a cofferdam, which may include engineering controls during removal and institutional controls.*

2.3.18 Comment: In 2015, the Texas Department of State Health Services issued its assessment of the occurrence of cancer in East Harris County. This investigation and report "was not intended to determine the cause of observed cancers or identify possible associations with any risk factors." However, we believe some of the results raised concerns potentially associated with the SJRWP Site. "Observed numbers of several of the 17 cancers analyzed were statistically significantly greater than expected." (TDSHS 2015) The number of cancer / census tract

combinations that were statistically significantly high exceeded the number that were statistically significantly low by a ratio of 3:1. The following types of childhood cancer had Standardized Incident Ratios (SIR) of greater than 2 in at least one of the census tracts in East Harris County: brain, leukemia, glioma, melanoma, and retinoblastoma. SIRs of greater than 2 were found in some census tracts for the following cancers for all ages: brain, male breast, cervix (5 different tracts between 2.02 and 4.81) and liver. Of particularly concern is the incidence of childhood retinoblastoma, a rare eye cancer, with an SIR of 16.40 in the census tract closest to the SJRWP Site, and SIR of 14.35 in another census tract in the study area. Incidence rates for cancer of the cervix and kidney for "all ages" also were high in the census tract nearest the Site. Determining how to further investigate the results of this report has been problematic. Conducting a full epidemiological study of the community was rejected, and other alternatives aren't being actively pursued as far as we can determine. While a direct cause-and-effect relationship with the SJRWP Site can't be confirmed at this time, neither can it be excluded.

Response: *EPA understands the concern with cancer occurrences in East Harris County. It is expected that the selected alternative will result in lower dioxin concentrations in the river and potential uptake to fish tissue. However, a direct correlation of the Site to cancer occurrences in East Harris County is difficult to complete. Any comments or questions on Texas Department of State Health Services reports regarding the San Jacinto River Waste Pits Site should contact* epitox@dshs.state.tx.us *or 1-800-588-1248.*

2.3.19 Comment: Distributed throughout a 5-mile radius of the SJRWP are demographics particularly vulnerable to dioxin exposure; elderly and children. The community directly east of the Site has a disproportionate amount of children under the age of 5 years old. Between 14.3-18.9% of this community is under the age of 5 years old. Not only are the elderly and children "most sensitive to dioxin exposure, but also have the most difficult time evacuating and recovering from a flood event, further exacerbating the adverse impacts to this segment of the community. That said, exposure to the dioxins could potentially occur without the presence of a major storm due to the documented potential for chemical leakage" (Brody, 2014).

Response: *The PRGs selected for the Site were calculated based upon a child recreational user. These PRGs will be protective of this sensitive population and other receptors throughout the area.*

2.3.20 Comment: Numerous questions were submitted concerning the frequency of cancer in the area of the Site.

Response: *It has proven virtually impossible to correlate the presence of a contaminant source with cancer frequency in the vicinity despite many attempts at many sites. Therefore, the EPA chose to base the PRG on conservative risk-based principles. Any comments or questions on Texas Department of State Health Services reports regarding the San Jacinto River Waste Pits Site should contact* epitox@dshs.state.tx.us *or 1-800-588-1248.*

2.3.21: Comment: Region 6s Final Interim Feasibility Study deficient in a number of significant respects, resulting in an arbitrary and capricious Proposed Plan.

Response: *EPA disagrees that the Feasibility Study is deficient; however, EPA has requested the US Army Corps of Engineers to perform additional modeling in response to several requests to further support the selected remedial action. The fact that extreme erosion can and will occur was documented after the 1994 flood and to a lesser extent by the 8-foot scour that occurred adjacent to the cap in 2016. The scouring occurred at lesser river flood levels and without the occurrence of a hurricane. Responses to comments regarding the geomorphologic conditions of the Site are included in Section 5 (San Jacinto River Characteristics) below.*

2.3.22 Comment: The EPA Region 6's calculation of a threshold concentration of 300 ng/kg toxicity equivalent as the basis for its Principal Threat Waste determination deviates substantially from relevant guidance, is flawed and ignores site-specific information in favor of information not in the Administrative Record.

Response: *The EPA disagrees with this statement. Site-specific information including exposure frequencies, exposure duration, and ingestion rates for all its scenarios used in the baseline human health risk assessment were used in the EPA risk assessment. Minor changes were made to be consistent with EPA guidance and other national risk assessments. The EPA changed the child body weight from 19 Kg to 15 Kg as recommended in the EPA exposure factors handbook. The other value that was changed was the lifetime averaging value from 78 years to 70 years, again consistent with EPA guidance and other national risk assessments.*

Regarding conversion of risk-based PRGs to a Principal Threat Waste value, EPA policy sets a precedent for defining principal threat waste based on a multiple of a risk based level. In specific, waste demonstrating a carcinogenic risk of 10^{-3} is considered principal threat, which is 10 times higher than the upper end of the acceptable risk range of 10^{-4}. Based on this precedent, the PRG of 30 ng/kg based on non-carcinogenic was multiplied by 10.

2.3.23 Comment: The EPA Region 6's calculation of a threshold concentration of 300 ng/kg toxicity equivalent as the basis for its Principal Threat Waste determination deviates in a number of material respects from the requirements contained in EPA's Principal Threat Waste and risk assessment guidance, and Region 6's determination and application of a Principal Threat Waste threshold is not consistent with EPA's guidance. The result is that a cornerstone of EPA Region 6's rationale for its proposed remedy is arbitrary and capricious.

Response: *The EPA disagrees with this statement. EPA's risk evaluation is not arbitrary and capricious. It is a standalone scientific document that used EPA's acceptable risk assessment procedures, methodologies and guidance. The assessment went through internal reviews and was reviewed by EPA's headquarters risk assessors and scientists to make sure the assessment is consistent with guidance and other regional risk assessments evaluations.*

EPA policy sets a precedent for defining principal threat waste based on a multiple of a risk based level. In specific, waste demonstrating a carcinogenic risk of 10^{-3} is considered principal threat, which is 10 times higher than the upper end of the acceptable risk range of 10^{-4}. Based on this precedent, the PRG of 30 ng/kg based on a non-carcinogenic endpoint was multiplied by 10. EPA guidance defines Principal Threat Waste as source material of such mobility and toxicity that it bears potential to re-contaminate surrounded areas if re-distributed/released.

Using a factor of 10 assumes that waste would be diluted 10-fold during release over the area of exposure without causing exceedance of risk levels; this is not unreasonable. These points demonstrate that the definition of principal threat waste is neither arbitrary nor capricious.

2.3.24 Comment: The Risk Evaluation and the Principal Threat Waste determination based on it are not transparent and reach conclusions that cannot be replicated. It should be disregarded for that reason alone, and the Principal Threat Waste determination based on it should also be disregarded.

Response: *EPA disagrees with this statement. EPA's Risk Evaluation report provided all the equations and all the input parameters that went into the equations. All the input parameters provided in the BHHRA were used except for child body weight and lifetime averaging time. It also included exposure point concentrations reported in the BHHRA. By using these values and equations provided, the calculations and conclusions can easily be replicated.*

2.3.25 Comment: The Risk Evaluation ignores the Region 6-approved risk assessment and data from the Site and does not follow EPA guidance. It is not transparent and not in the Administrative Record. A preliminary remediation goal was calculated using a biota-sediment accumulation factor (BSAF). For the BSAF, EPA relies on a source of information unrelated to the Site even though (1) Site-specific BSAFs are available and (2) Region 6 required Respondents to develop that information because "[t]he calculation of Site-specific BSAFs is important in order to be able to determine the acceptable sediment concentration to be protective of the human consumption of edible fish and shellfish."

Response: *EPA disagrees with this statement. EPA requested a Site-specific BSAF value because of its importance in developing an appropriate Site-specific sediment cleanup level. However, the Site specific BSAF values, reported in the Remedial Investigation and BHHRA, varied significantly and the concluded that using these Site specific BSAF values to develop sediment preliminary remediation goals would give unreliable results. The BSAF in EPA's HHRA came from EPA's Combustion guidance.*

2.3.26 Comment: Region 6 inappropriately uses EPA's results to calculate a much lower (by a factor of ten) Principal Threat Waste threshold concentration than the Site-specific data and Principal Threat Waste Guidance would support; EPA offers no explanation for the decision to deviate from guidance by not using Site-specific data in his analysis.

Response*: The Site-specific data does not support a Principal Threat Waste which is larger by a factor of ten. EPA used non-cancer effects in its evaluation of adverse health effects presented by dioxin and dioxin-like compounds as toxicity equivalents. If non-cancer effects are used, then the Preliminary Remediation Goal developed by EPA is appropriate (see response to Comment 2.3.27). Moreover, EPA policy sets a precedent for defining principal threat waste based on a multiple of a risk based level. Specifically, waste demonstrating a carcinogenic risk of 10^{-3} is considered principal threat, which is 10 times higher than the upper end of the acceptable risk range of 10^{-4}. Based on this precedent, the PRG of 30 ng/kg based on non-carcinogenic was multiplied by 10 to calculate the principle threat waste.*

2.3.27 Comment: The following are the specific shortcomings in EPA's risk assessment approach. EPA calculates risk associated with recreational fishing using a noncancer reference dose. Using the noncancer reference dose, EPA calculates the toxicity equivalent in sediment that corresponds to an acceptable noncancer risk level (a hazard index of 1) for a hypothetical recreational fisher. The resulting preliminary remediation goal for sediments of 30 ng/kg toxicity equivalent accounts for both direct exposure and indirect exposure routes, including fish ingestion. The use of fish ingestion as an exposure pathway is inappropriate, for reasons discussed below. EPA states that the Preliminary Remediation Goal, 30 ng/kg toxicity equivalent, equates to a 2.1×10^{-5} excess lifetime cancer risk. Region 6 multiplies this value by 10 (without any explanation as to the basis for that calculation) to derive its Principal Threat Waste threshold of 300 ng/kg. Therefore, the Region 6 threshold value for designating wastes as Principal Threat Waste is equivalent to an excess lifetime cancer risk of 2.1×10^{-4} (calculated by multiplying 2.1×10^{-5} by a factor of ten). This is a lower risk than the excess lifetime cancer risk of 10^{-3} that EPA's Principal Threat Waste Guidance suggests be considered in determining whether a source material is Principal Threat Waste, and a lower risk than called for in EPA's 1997 guidance referred to as the "Rule of Thumb." The Principal Threat Waste Guidance, while not explicitly defining what threshold level of risk equates to principal threat, states that "where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be considered." EPA Region 6's use of 300 ng/kg as a Principal Threat Waste threshold is overly conservative in the sense that it sets an inappropriately low cancer risk threshold (below 10^{-3}) for considering waste to be Principal Threat Waste.

Response: *The definition of Principal Threat Waste provided by EPA guidance is not restricted to the basis of carcinogenic risk and the sediment PRG developed by EPA is based on non-cancer effects. EPA considered the scientifically verified and peer reviewed toxic value of dioxin for noncancer effects. As published in the EPA Integrated Risk Information System (IRIS), the toxicity value or reference dose developed for TCDD is based on human epidemiological data and not based on animal data. The noncancer toxicity values for TCDD were based on endocrine disruption observed in a sensitive susceptible young population. IRIS gave a confidence level of "High" to the non-cancer toxicity value for dioxin. Dioxin is known to have both cancer and non-cancer effects, therefore EPA evaluated the risk from both types of adverse health effects. EPA used a tier 3 cancer toxicity value in its cancer risk evaluation since there is no cancer toxicity value published in IRIS. Tier 3 cancer toxicity values did not go through rigorous proper peer review and are usually not verified for its proper scientific validity as usually is done for tier 1 toxicity values. Consequently, EPA relied on the tier 1 toxicity value for non-cancer effects in its decision regarding the Site and included the cancer effects to show that, by cleaning the Site down to the non-cancer effects level, EPA is also protecting for cancer effects.*

EPA in its quick reference fact sheet "A Guide to Principal Threat and Low Level Threat Wastes (PTW)" November 1991, Superfund Publication: 9380.3-06, states the following: "No "threshold level" of toxicity/risk has been established to equate to "principal threat". However, where toxicity and mobility of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be evaluated." However, TCDD equivalents has been found to cause human non-cancer adverse health effects at levels below the upper end of the EPA acceptable excess cancer risk range of 10^{-4}. Although the Principal Threat Waste guidance

does not set a threshold level of toxicity/risk, it clearly leaves the door open to evaluating potential toxicity/risk of chemicals involved. Applying an order of magnitude for noncancer effects is equivalent to the use of 10^{-3} cancer levels to define Principal Threats. EPA not only relied on dioxin toxicity but also considered other factors in its evaluation of Principal Threat Waste. The other factors considered include the history of severe flooding in the San Jacinto River, the documented extensive erosion of the river, the high degree of uncertainty in predicting the effects of flooding for hundreds of years, the need for repeated cap maintenance, and by the discovery of a 400-square foot area of dioxin that was over 1,000 times more concentrated than the 30 ng/kg toxicity equivalent Preliminary Remediation Goal for sediment. A containment or capping remedy must be able to reliably contain the wastes, but the factors listed above do not support a conclusion that the dioxin waste could be consistently contained for hundreds of years.

2.3.28 Comment: EPA's Preliminary Remediation Goal is not derived using Site-specific information. EPA instead uses several factors, including a BSAF from EPA's Risk Assessment Guidance for Hazardous Waste Combustion Facilities. The BSAF values that EPA uses are from a document that is not in the Administrative Record and does not use Site-specific data or data for the San Jacinto estuary. The Combustion Guidance is not clear as to how and with what data set the reported BSAFs were derived, and the BSAF used by EPA could not be replicated by Respondents. As a result, this cornerstone of Region 6's analysis is not transparent.

Response: *EPA does not agree that the analysis lacks transparency. The Site specific BSAF values were not adequate to derive a reliable sediment Preliminary Remediation Goal value as admitted in the PRPs own evaluation. Reference to the combustion guidance was provided in the references section of EPA's risk evaluation report. The methodology used to develop dioxin BSAF values is presented in Appendix A of the combustion guidance.*

2.3.29 Comment: To appropriately calculate a sediment PRG that accounts for fish ingestion, EPA should have instead used Site-specific BSAFs provided in Appendix B of the Remedial Investigation Report (which is in the Administrative Record). Those BSAFs were derived to reflect local exposure conditions for fish, which is consistent with EPA's BSAF Guidance and, from a technical perspective is much more appropriate than relying on the BSAFs that EPA used. During the Remedial Investigation for this Site, when Region 6 directed Respondents to develop Site-specific BSAFs, that appears to have been Region 6's perspective as well. Appendix B of the Remedial Investigation Report includes tables with the Site-specific BSAF values, and all relevant details on how they were derived.

Response: *The Site specific BSAFs were not used because they varied over orders of magnitude, and were determined to be unreliable. Appendix B of the Remedial Investigation, specifically states that the Site-specific BSAF would "generate unreliable results" due to the high variability of the Site specific BSAF data. Therefore, the EPA did not use the Site specific BSAF values developed by the PRPs. EPA was transparent and provided justification for the use of a BSAF value provided in the EPA Combustion guidance (US EPA, 2005). EPA's Combustion Guidance BSAF value of 0.09 pg/g tissue per pg/g sediment for calculating the sediment PRG value was judged to be reasonable, and the derivation of the BSAF is provided in detail in US EPA (2005).*

2.3.30 Comment: Using EPA's analysis and rationale, but using Site-specific BSAF values from Appendix B, the sediment concentration corresponding to a 10^{-3} cancer risk would be 3,000 ng/kg. Putting aside other defects in Region 6's analysis, if Region 6 had used this as its Principal Threat Waste threshold, there would be no justification for removal of the Eastern Cell of the Northern Impoundments, since most of that part of those Impoundments (all but two surface samples) has toxicity equivalent concentrations below 3,000 ng/kg. Of the material that would be required to be removed under Alternative 6N, approximately 44,000 cubic yards of it (or about 29% of the total 152,000 cy to be removed) is located in the Eastern Cell.

Response: *EPA did not use the cancer effects in its risk evaluation to determine the Preliminary Remediation Goal for the Site sediment because EPA currently does not have a cancer toxicity value published in IRIS. Instead EPA used the current non-cancer effects that were published in IRIS in February 2012. The non-cancer effects are based on human health epidemiological studies that show protecting human health from non-cancer effects is at levels lower than levels protecting human health at the upper end of the EPA acceptable risk range of 10^{-4}. In other words, using current tier 3 toxicity values for protecting human health at dioxin levels associated with 10^{-4} excess cancer risk effects will not be protective for non-cancer adverse health effects at a HI of 1. Further, Site specific BSAF values determined by the PRP exhibited a wide range of values spanning orders of magnitude, and use of these Site specific BSAF values was deemed to be unreliable by the PRP.*

2.3.31 Comment: Region 6 inappropriately derived a Principal Threat Waste threshold by multiplying EPA's Preliminary Remediation Goal by a factor of ten, thereby basing its Principal Threat Waste threshold on an indirect exposure pathway in contravention of applicable guidance. The EPA's Principal Threat Waste Guidance addresses risk management associated with "source material," which is defined by EPA as "…material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or acts as a source for direct exposure." However, EPA Region 6's threshold concentration for Principal Threat Waste incorporates fish ingestion as an exposure pathway. This is inappropriate because the fish themselves are not source material, and the fish cannot be subjected to treatment or any other remedy. Although fish may be contaminated by exposure to source material, fish tissue is not source material with which humans may have direct contact and that could be addressed by treatment. Therefore, derivation of a Principal Threat Waste threshold on the basis of indirect exposure through fish ingestion is not consistent with EPA Principal Threat Waste Guidance.

Response: *The comment inaccurately poses that fish are being considered as a source of dioxins. The waste and contaminated sediment are the source. Fish are not considered here as a chemical source, but as a pathway for direct exposure. Sediment acts as a reservoir for dioxins that may migrate to fish tissue. Only sediment values were used in calculating sediment Preliminary Remediation Goals. Although not mentioned specifically in the quote above from the guidance, "…material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, to surface water, to air, or acts as a source for direct exposure"; it is clear that the guidance includes source materials migration to other media including biota.*

2.3.32 Comment: EPA Region 6's approach to deriving a Preliminary Remediation Goal threshold is further contrary to the provision of EPA's Principal Threat Waste Guidance that "…this concept of principal and low level threat wastes should not necessarily be equated with risks posed by Site contaminants via various exposure pathways." EPA Region 6's analysis to derive a Principal Threat Waste threshold does exactly what the guidance instructs should not be done - it incorporates risk via an indirect exposure route, ingestion of fish that have bio accumulated dioxins and furans.

Response: *EPA does not agree with this comment. The Principal Threat Waste guidance also says the following: "Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur". Dioxin is known to be highly toxic and the highly contaminated sediment at the San Jacinto River Waste Pits Site would present a significant risk to human health and the environment should exposure occur. EPA included only sediment values in developing its sediment Preliminary Remediation Goal values. EPA did not only consider the highly toxic dioxin effects on human health but also considered other factors other than the risk associated with the Site, in determining if the waste is Principal Threat Waste. EPA also considered other factors in its evaluation of Principal Threat Waste. The other factors include the history of severe flooding in the San Jacinto River, the documented extensive erosion that have occurred in the San Jacinto River, the high degree of uncertainty in predicting the effects of flooding for the hundreds of years that dioxin may remain toxic, the need for repeated temporary cap maintenance, and by the exposure of a 400-square foot area of dioxin that was over 1,000 times more concentrated than the 30 ng/kg PRG. A containment or capping remedy must be able to reliably contain the wastes, but the factors listed above do not support a conclusion that the dioxin waste could be consistently contained for hundreds of years.*

2.3.33 Comment: The manner in which EPA derived certain values and the rationale for deviating from applicable guidance cannot be determined. Given this lack of transparency, the EPA Risk Evaluation and conclusions based on it should be disregarded, as any reliance on it would be arbitrary and capricious. EPA's approach to calculating a Site-specific PRG for sediments is not transparent. The related calculations and conclusions cannot be replicated from information in the Administrative Record and EPA has not explained its rationale for deviating from applicable guidance. The lack of transparency is such that any reliance on the EPA Risk Evaluation or the conclusions reached in reliance on it would be arbitrary and capricious.

Response: *EPA does not agree that the risk evaluation is not transparent or that it is arbitrary and capricious. EPA followed EPA's risk assessment process by utilizing methodologies and procedures recommended in EPA risk assessment guidance. Equations were provided and each input parameter required for the equations. EPA used the same input parameter values that were used in the Baseline Human Health Risk Assessment, and noted that in footnotes to Tables 1 and 2 and throughout the report. With the exception of child body weight and life time, which were consistent with EPA guidance (See response to Comment 2.3.22), PRP exposure parameters were used.*

2.3.34 Comment: The EPA Evaluation is not transparent in a number of other respects. It appears to, in part, adopt the approach taken in the Baseline Human Health Risk Assessment for the Site, but does not clearly explain important departures from the Baseline Human Health Risk Assessment. For example, some of the exposure factors assumed by EPA and other considerations in EPA's exposure calculations are different from those adopted in the Baseline Human Health Risk Assessment (*e.g.*, child body weight, life time). Neither EPA nor Region 6 provide rationale for departing from exposure assumptions previously developed and documented by Respondents in collaboration with and approved by EPA Region 6. This is an additional reason why EPA Region 6's choice to rely upon the Risk Evaluation as the basis for its determination of a Principal Threat Waste threshold is arbitrary and capricious.

Response: *EPA does not agree that the Principal Threat Waste threshold is arbitrary and capricious. EPA used a child body weight and life time recommended by the EPA guidance (EPA, 2011). This child body weight and lifetime are used consistently throughout the nation by all regions. If one uses a 6-year exposure duration for a young child, then an average body weight of 15 Kg should also be used (please see response to Comment 2.3.22).*

2.3.35 Comment: The EPA Risk Evaluation does not explain or present the data used to estimate exposure, and the exposure point concentrations the EPA calculates are not reproducible. EPA does not present or describe the specific environmental samples used to calculate exposure point concentrations used in his evaluation, how those data were treated (*e.g.*, averaging of duplicates), or how toxicity equivalents were calculated (*e.g*., using a value of one-half the detection limit, the full detection limit, or zero for non-detected congeners). EPA does not describe the statistical methods used for estimating exposure point concentrations, and does not present equations used for estimating Preliminary Remediation Goals for individual exposure pathways or for all exposure pathways combined.

Response: *EPA did not develop a new Baseline Human Health Risk Assessment. They relied heavily on the risk information provided in the Remedial Investigation and the Baseline Human Health Risk Assessment. EPA used the same Exposure Point Concentrations that were developed and used in the Baseline Human Health Risk Assessment (Integral, 2013). The Exposure Point Concentrations reported in the Baseline Human Health Risk Assessment were reviewed and found to be adequate since calculations follow all appropriate guidance. The Exposure Point Concentrations used were the same as Exposure Point Concentrations reported in the Baseline Human Health Risk Assessment. The Exposure Point Concentrations for Beach Areas A, B/C, D, and E reported in Table 1 and Table 2 in EPA's report are the same as Exposure Point Concentrations in Table 5-2 in the Baseline Human Health Risk Assessment (Integral, 2013). The Exposure Point Concentrations for Fish Collection Areas reported in EPA's Tables 3 and 4 are the same Exposure Point Concentrations in Table 5-3 in the Baseline Human Health Risk Assessment (Integral, 2013). In situations where the Baseline Human Health Risk Assessment did not follow the guidance, they were modified: e.g., the guidance requires that dioxin-like PCBs be added to the total dioxin Exposure Point Concentrations. Such modifications were reported in EPA's report in the footnotes to Tables 3 and 4.*

2.3.36 Comment: In a significant departure from EPA's risk assessment guidance, DEPA fails to recognize and discuss the sources and impacts of uncertainties on the calculated risk estimates

and PRGs. EPA guidance on completing risk assessments, establishing PRGs, and selecting remedies clearly states that uncertainties must be evaluated, and their impacts considered in the context of decision making. EPA's 1991 Guidance for Establishing PRGs states "[r]isk based PRGs are associated with varied levels of uncertainty depending on many factors … To place risk based PRGs that have been developed for a site into perspective, an assessment of the uncertainties associated with the concentrations should be conducted." EPA's Rules of Thumb states that evaluating and discussing uncertainties is a key component of the risk characterization process that is critical for the selection of a remedy. EPA recognizes and addresses only a single uncertainty - that resulting from using a Tier 3 cancer slope factor for dioxin. He ignores other sources of uncertainty inherent in the risk assessment process including uncertainties in the data used, data processing, and exposure assessment.

Response: *EPA was not trying to develop a new Baseline Human Health Risk Assessment, rather the goal was to complement the Baseline Human Health Risk Assessment by correcting areas where it was deficient or lacking support. The Baseline Human Health Risk Assessment addressed sources of uncertainties and their impact on the risk assessment. Those uncertainties were considered by EPA in its risk management decision.*

2.3.37 Comment: The analysis presented by EPA is completely deficient relative to the Region 6 approved, Site-specific risk assessment documents and protective concentration levels, and is not consistent with EPA's own guidance. Region 6's use of EPA's analysis as the basis for its Principal Threat Waste threshold of 300 ng/kg is arbitrary and capricious, given its ambiguities and shortcomings, its lack of transparency, and the fact that its results cannot be reproduced.

Response: *On the contrary, EPA developed a balanced well thought risk analysis keeping with all EPA recommendations and guidance. All equations and input parameters were provided in detail to easily reproduce the same risk and cleanup numbers. EPA evaluations relied heavily on the Baseline Human Health Risk Assessment input exposure parameters and Exposure Point Concentrations. The Principal Threat Waste determination was not only based on toxicity but also on potential mobility, weather conditions, and dynamics of the river.*

2.3.38 Comment: Dioxins and furans from within the waste impoundments have not been significantly transported outside of the original 1966 perimeter of the waste impoundments.

Response: *The sediment fingerprint analysis and the surface water analysis results showed a different dioxin/furan chemical signature in the vicinity of the areas outside of the waste impoundments from the background areas. Specifically, the waste impoundments and areas in the vicinity of the impoundments showed a strong signature of 2,3,7,8-TCDD and 2,3,7,8-TCDF which was absent in all of the other fingerprinted areas. This shows that dioxin/furan has been released beyond the limits of the original waste impoundment boundaries. The waste impoundments thus act as a source of dioxin/furans that are being released to the surrounding environment and elimination of this source will mitigate this release.*

2.3.39 Comment: Implementation of the TCRA and the existing cap have already achieved significant risk reduction.

Response: *EPA agrees the TCRA construction has resulted in reduction of the current risk; however, EPA disagrees that future risk reduction can be reliable achieved over the long-term. In addition, the continuing maintenance of the temporary cap in the six years since construction has showed no signs of lessening based on past issues with its structural integrity. Further, the maintenance performed was in response to low intensity flooding than the designed flood. This does not provide assurance that more significant cap damage will occur for the design storm or hurricanes, or larger more intense storms, and their associated wave action. This is also documented in the riverbed scour which occurred in 2016 adjacent to the temporary cap following flooding less intense than the design flood and does not give the assurance that greater undermining of the cap will not occur with more intense flooding over time. Moreover, US Army Corps of Engineers modeling indicates that under severe weather events, dioxin release from the cap with future enhancements (Alternative 3N) could be as high as 170 g. EPA does recognize that cap maintenance may be accomplished following receding of flood waters or hurricanes to repair any damage to the cap; however, any dioxin release to the river would have already caused impact. Finally, EPA disagrees that the potential releases during implementation of alternative 6N were not considered. In fact, these were specifically discussed in the US Army Corps of Engineers report and in the Proposed Plan.*

2.3.40 Comment: Site specific data, including 2016 data that Region 6 declined to consider, demonstrates that the wastes in the southern impoundment are contained and do not present an unacceptable risk to people or the environment.

Response: *EPA disagrees that the 2016 data was not considered. This data was evaluated to assess whether the southern impoundment is currently containing the waste material. However, this data does not address the long-term reliability of the pits in the environment of the San Jacinto River. Experience and documentation of past flooding indicates that new channels have been created by the fast flowing water as reported by the National Transportation Safety Board. Past experience and documentation has also shown that flooding travels in both the San Jacinto River channel and the Old River channel (travels on both sides of the southern impoundment). Moreover, US Army Corps of Engineers modeling indicates that under severe weather events, scour could occur which would result in a TCDD release from the cap with enhancements (Alternative 3N) that could be as high as 170 g. There is no assurance that the waste can be reliable contained over the long-term.*

2.3.41 Comment: Region 6 has no credible basis for asserting that buried waste in the southern impoundment could become mobile.

Response: *Experience and documentation indicates past flooding and fast flowing water has created new channels as reported by the National Transportation Safety Board. Past experience and documentation has also shown that flooding travels in both the San Jacinto River channel and the Old River channel (travels on both sides of the southern impoundment). There is no assurance that the waste can be reliable contained over the long-term.*

2.3.42 Comment: If the remedy is implemented as USEPA envisions, when will the fish consumption advisory for dioxin be removed from the area?

Response: *EPA does not anticipate the fish consumption advisory to be lifted upon the completion of the removal activities. The impact to the fish population cannot solely be placed on the waste material currently within the waste pits. Along with the wastes material in the waste pits, non-point source contributions, and additional chemical contaminants besides dioxins present in the river, as a total, triggered the fish advisory to be issued.*

2.3.43 Comment: If the remedy is implemented as USEPA envisions, when will local groundwater be restored to pristine condition?

Response: *It is not anticipated that removal of the dioxin waste will have any impact on local ground water. Site ground water sampling has indicated that dioxin has not migrated from the waste pit area. Further, the dioxin, while present in local wells, has been reported to be below the federal Maximum Contaminant Level for dioxin in drinking watetr, as well as having a different chemical fingerprint from the waste in the waste pits. However, removal of the source material should prevent any future impacts from occurring.*

2.3.44 Comment: What are the risks to the community associated with diesel exhaust and dust particles during operations and transportation?

Response: *The Remedial Design will address and identify risks associated with the removal and transport of waste material and will develop best management practices to limit impacts and inconveniences to the surrounding communities. Best management practices could include but not limited to the hours of operation, dust suppression measures, monitoring weather conditions, etc. Access to I-10 is only about 1½ miles from the Site via the East Freeway Service Road, which is primarily used for non-residential, commercial/industrial traffic and trucking. The number of trips per day depends of the size of the trucks used. If small trucks are used for disposal, the maximum round trips per day would be about 200, including disposal trucks, deliveries and workers. For a 12-hour work day, it would be a vehicle about every four minutes. If 20 cubic yard trucks were used, there would be one truck every 10 to 15 minutes, or about one vehicle every six minutes including worker traffic and deliveries. There is little other traffic over most of the route. The traffic volume is inconsequential for I-10 and its ramps, representing about 0.1 percent of the average daily traffic on I-10 and less than three percent of the ramp capacity. Because the incremental traffic on I-10 is very small, the incremental diesel exhaust would also be expected to be very small.*

2.3.45 Comment: What are the health and safety risks to the workers and the public associated with operation of heavy equipment and increased truck traffic on the highways between the Site and the selected off-site landfill?

Response: *The location and type of final disposition for the waste has not been determined but will be during the Remedial Design. Construction activities associated with onsite activities will follow Occupational Safety and Health Administration requirements under the Hazardous Waste Operations and Emergency Response Standard once the final design has been approved. Offsite vehicle movement will follow Department of Transportation regulations and a transportation plan will be developed to promote safety. Because the incremental traffic on*

I-10 is very small, at least in the vicinity of the Site, the incremental health and safety risks from increased truck traffic would also be expected to be very small.

2.3.46 Comment: EPA mentions a target of "reliability" over a time period of 500 years. EPA's use of a 500-year benchmark for reliability is, in my view, extreme. EPA's rationale for selection of such an extreme benchmark is presumably tied to the length of time dioxin may remain toxic.

Response: *The longevity of dioxins in the environment drives the need for consideration of a long time frame regarding the reliability of a containment system for the Site.*

2.3.47 Comment: Alternative 6N does remove a mass of waste from the aquatic environment, but there will be significant residual waste and associated contaminants, so essentially for Alternative 6N we would be left with two containments for the same waste, a cap over deep inventory and residuals and an off-site landfill.

Response: *Alternative 6N would separate high concentration, high toxicity, bioaccumulative principal threat waste into a licensed, regulated upland landfill with appropriate controls in place. The dioxin exceeding the 30 ng/kg cleanup level in the waste pits will be removed, so there will be no need for a containment system there.*

2.3.48 Comment: Compared to the baseline risks calculated for the Site, will risks to human health and the environment increase due to the expected loss of dioxin during construction of the remedy?

Response: *It is not expected that risks to human health and the environment will increase above the baseline risks calculated in the BHHRA due to construction of the remedy particularly with a "dry" remedial design approach behind the protection of a cofferdam.*

2.3.49 Comment: How much dioxin is expected, even under ideal conditions, to migrate downstream due to ineffective control measures, especially in a large river like the San Jacinto River?

Response: *This is dependent on which alternative is selected. The minimum dioxin release, over the long term, would be from Alternative 6N because there is no potential for a storm related future release, and because excavation in the "dry" behind a cofferdam will prevent the residuals and resuspension associated with dredging under water, which will not be a part of Alternative 6N.*

2.3.50 Comment: Does USEPA expect to see higher levels of dioxins in fish following construction of the remedy, as have been observed at other sediment remediation sites?

Response: *Experience at other sites, such as the Hudson River, has shown a short-term increase in fish tissue concentrations followed by a long-term decrease to levels below pre-remedy conditions. However, the use of "dry" removal remediation should limit any incidental releases of dioxin/furans during the removal.*

2.3.51 Comment: What is the risk of unintended contamination of recreation and commercial fisheries in downstream areas such as Galveston Bay due to residual contamination and/or potential catastrophic loss of contamination during implementation of the full removal plan?

Response: *It is not expected that risks to human health and the environment will increase above the baseline risks calculated in the BHHRA due to construction of the remedy. Following removal, there is no potential for a release because the waste will have been removed.*

2.3.52 Comment: How long will the elevated risks associated with releases during construction continue before risks return to baseline levels?

Response: *Risks are not expected to be elevated above baseline during construction because the excavation will be completed in the "dry" and not subject to the typical residuals and resuspension associated with dredging.*

2.3.53 Comment: What are the risks to the community associated with fugitive emissions of the contamination during removal, drying and transportation of waste material from the Site during construction?

Response: *There are a number of techniques that are used to control fugitive emissions from contaminated sediment sites. These items along with other best management practices will be fully explored, assessed, and included in the design plans as necessary. The work plan developed for implementing the remedy will include provisions for containing and controlling losses from excavated sediment. The traffic volume is inconsequential for I-10 and its ramps, representing about 0.1 percent of the average daily traffic on I-10 and less than three percent of the ramp capacity. Because the incremental traffic on I-10 is very small, the incremental diesel exhaust would also be expected to be very small.*

2.3.56 Comment: Reasonable estimates of the resuspension and releases that inevitably would result from each remedial alternative are necessary to permit reasoned comparisons of the net risk reduction associated with each alternative. The risks associated with resuspension and releases may be substantial because, as the Guidance notes, sediment resuspension losses "generally range from less than one percent to between 0.5 and 9 percent." (p. 6-23) These estimates and their incorporation into the remedy evaluation process are mandated by the Sediment Guidance (Sections 6.2, 6.5.5, 6.5.6, 6.5.7, Highlight 6-11, and Highlight 7-3). Here, the Region appropriately requested the evaluation of potential releases at this Site during the proposed removal of the cap and underlying waste in order to benefit from the world renowned expertise of the Army Corps on this subject and should heavily rely on the Corps' conclusions that some releases are inevitable despite use of Best Management Practices (BMPs) and that significant releases are likely to occur during heavy rain events or other storms that have been documented to occur locally at a regular frequency. In fact, the Army Corps Report notes that contaminant mobilization from resuspension is expected to release 400,000 times as much contaminants as currently occurs with the intact cap (U.S. Army Corps Report at p. 6) and possibly five times higher than that if a flood event occurs (Id. at p. 7). Experience at other sites shows that resuspension and release of contaminants during dredging events can have long-term

effects on the aquatic ecosystem. For example, the dredging in Commencement Bay in Seattle in 2004 caused a spike in fish tissue concentrations that persisted for years (Patmont, et al., Battelle 2013). After two major dredging projects were completed, concentrations of PCBs in fish tissue are still higher than they were over 20 years ago before dredging began (38 ppb before and 70 ppb after). Simply hoping to "do a better job" dredging than in all past projects is not a realistic expectation and does not constitute sound decision-making.

Response: *The comment regarding resuspension and release is based on dredging, or removal in the wet, where water is able to be transported through the Site, with limited residuals management, and with a low potential for natural recovery as existed for the dredging in Commencement Bay. The US Army Corps of Engineers evaluation report (2016) predicted similar responses when dredging is performed with traditional methods. Therefore, to eliminate this potential exposure and bioaccumulation in fish during removal operations and from residuals following removal operations, the removal will be performed in the "dry" by dewatering the Site using a cofferdam. The US Army Corps of Engineers performed an evaluation documenting trade-offs between long-term and short-term risks of release. Alternative 6N provides a more certain, quantifiable outcome, especially with excavation in the "dry", than the current cap with enhancements, with lower overall potential for release of mass. The use of an armored cap will be inadequate to contain the pulp waste over the long-term.*

2.3.57 Comment: The expected release from localized disturbances with an enhanced cap is projected to be more than 1,000 times smaller than compared to the proposed removal action.

Response: *Releases from removal are only greater if it is assumed that there are no large-scale disturbances to a cap. If there are large scale disturbances (i.e. significant scour of the cap), US Army Corps of Engineers modeling has shown that release could be much more that from removal for a single event. Utilization of excavation in the "dry" in the selected remedial action will greatly reduce releases associated with the Alternative 6N removal.*

2.3.58 Comment: The COE projects that the removal action will set back the natural recovery of the Site by more than 10 to 20 years.

Response: *This estimate is based on alternatives that include underwater dredging, with the associated resuspension and release. Selection of Alternative 6N with a cofferdams and excavation in the "dry" will preclude any material releases from the Site.*

2.3.59 Comment: Under the selected removal option potential exposure to the contaminants of concern will be 4,000 times greater than with a secure closure in place.

Response: *First, this comment assumes that there will be no large-scale future disturbances to a cap. If there are large scale disturbances (i.e. significant scour of the cap), US Army Corps of Engineers modeling has shown that releases could be much more than from removal for a single event with future cap erosion. Further, this estimate is based on evaluation that includes underwater dredging, with the associated resuspension and release. Selection of Alternative 6N with a cofferdams and excavation in the "dry" will preclude any material releases from the Site.*

2.3.60 Comment: Increases in the release of contaminants directly related to the proposed removal will also be directly related to fish tissue concentrations hundreds of time greater for a duration of years. The proposed plan fails to clearly demonstrate how any of the remedial action objectives will be met. Rather, the failure to consider the enhanced closure in place will have exactly the opposite effect, essentially significantly increasing the release from the impoundments of the very dioxins over which the surrounding communities and citizens have expressed so much interest, concern and even fear.

Response*, Removal is associated with more certainty in decreasing long-term risks. With conventional dredging, removal is typically associated with a short-term increase in fish tissue concentrations but is expected to decrease tissue concentrations and risks long-term. Selection of Alternative 6N with cofferdams and excavation in the "dry" will preclude any material releases from the Site.*

2.3.61 Comment: Regardless of the suppositions about the performance of a significantly enhanced cap, the simple fact is that the current cap, although well below the desired future standards, is working. Data requested by EPA to be collected clearly show that concentrations of toxic constituents of concern in surface sediments are currently below protective concentration levels and continue to decline. Except for samples from wells intentionally completed in the waste deposits, groundwater samples both north and south of IH 10 are in compliance with Texas surface water quality standards and show no mobility to surface waters. Samples of porewater do not detect constituents of concern and fish tissue concentrations (Gulf killifish) show virtually no difference upstream or downstream of the site. Given that the current cap is performing the job it is intended to perform, there is every good reason to believe that a significantly enhanced cap will continue to do the same and with far greater certainty.

Response: *EPA concurs that the current cap has improved conditions; however as noted in previous comment responses, the current cap has exhibited weaknesses, and even with the placement of a significantly enhanced cap, would be unlikely to be able to withstand an event such as a major hurricane. The selected alternative for removal instead of capping the wastes is the only one that will eliminate the problem (and resultant risks) for the long term.*

2.3.62 Comment: Consistent with the general chemical properties of dioxins and furans, the capped pulp waste at this Site should not be considered mobile.

Response: *The dioxin may be mobile in the environment of the Site given the conditions in the San Jacinto River, hurricanes, etc. While it is true that transport of dioxin and furans via water (groundwater or surface water) is not favored due to their physical/chemical properties, the primary concern of EPA is a failure of the cap that covers principal waste. A severe storm event could release and mobilize, large quantities of contaminated sediment and waste across the area. EPA does not believe that an armored cap can be reliably used that would prevent failure during such an event. Consequently, while groundwater and surface water transport may be inhibited due to dioxin and furan physical properties, transport of sediment and/or wastes in the event of a cap failure would mobilize them into the surrounding environment.*

2.3.63 Comment: EPA Region 6's preferred remedy does not focus or streamline the remedial action and does not specify treatment of any source materials.

Response: *The remedy has been focused and streamlined to the extent practical. Several treatment technologies were considered as a part of the Feasibility Study process, however, treatment is not typically considered an option for large volume dioxin waste. Some treatment using de-watering will be completed as required to meet the disposal requirements.*

2.3.64 Comment: EPA Region 6 failed to present evidence that the designated waste is highly mobile or toxic.

Response: *The dioxin waste was shown to be mobile based on the modeling conducted by the US Army Corps of Engineers using the current temporary cap with enhancements (Alternative 3N). Further, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

Regarding the toxicity of dioxin, the human health effects from exposures to dioxin and dioxin like compounds have been documented extensively in epidemiologic (human) and toxicological (animal) studies. TCDD is one of the most toxic members of this class of compounds and has a robust toxicological database. The USEPA thoroughly and publicly reviewed the toxicity of TCDD and published a reference dose (RfD) for TCDD in 2012 (EPA's Reanalysis of Key Issues Related to Dioxin Toxicity and Response to NAS Comments, Volume 1, EPA/600/R-10/038F, February 2012). The USEPA is not currently assessing the carcinogenicity of TCDD. The World Health Organization's International Agency for Research on Cancer (IARC) and the U.S. National Toxicology Program have both independently concluded that TCDD is a known human carcinogen.

EPA gathers evidence from a variety of sources regarding the potential for a substance to cause adverse health effects (carcinogenic and noncarcinogenic) in humans. These sources include controlled epidemiologic investigations, clinical studies, and experimental animal studies. Supporting information may be obtained from sources such as in-vitro test results and comparisons to structure-activity relationships. Taken together, EPA then develops a quantitative analysis and reports qualitatively the confidence in the study from which toxicity values were derived. In most cases one type of study does not provide conclusive evidence on its own, so researchers usually look at both human and lab-based studies and other supporting information when trying to determine if something causes cancer.

EPA recognizes that several epidemiological investigations involved Vietnam veterans. One of those studies was completed by the Centers for Disease Control, Atlanta, on U.S. Army Vietnam

veterans who were likely to be exposed to the herbicide Agent Orange. Serum levels of TCDD, a toxic contaminant in Agent Orange, were obtained for 646 ground combat troops who served in heavily sprayed areas of Vietnam, and for 97 veterans who did not serve in Vietnam. TCDD medians for Vietnam veterans (median = 3.8 ppt) and non-Vietnam veterans (median = 3.9 ppt) were virtually the same. This study is consistent with later studies and suggests that most U.S. Army ground troops who served in Vietnam were not heavily exposed to TCDD. (JAMA 1988;260:1249-1254).

The EPA also looked at studies done on other groups of people: 1) herbicide manufacturing workers, herbicide applicators and farmers who often had much higher blood dioxin levels than Vietnam veterans; 2) people exposed to dioxin after industrial accidents in Seveso (Italy) and Germany; and 3) people after chronic exposures at work and in the environment. The EPA considered this information in developing its toxicity value for TCDD.

The EPA followed the National Contingency Plan or NCP (a rule implementing the Superfund program) and other guidance in developing a site-specific baseline risk assessment for the San Jacinto River Waste Pits Superfund Site. EPA's selection of toxicity values for dioxin was based on EPA's December 5, 2003, directive Human Health Toxicity Values in Superfund Risk Assessments. This directive provides a hierarchy, based on best science available, of human health toxicity values generally recommended for use in risk assessments at Comprehensive Environmental Response Compensation and Liability Act (CERCLA, or Superfund) sites. The hierarchy consists of three tiers:

- *Tier 1. EPA's Integrated Risk Information System (IRIS) toxicity values*

- *Tier 2. In the absence of IRIS values, selection of EPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs). The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical specific basis when requested by EPA's Superfund program.*

- *Tier 3. In the absence of PPRTVs, selection of Other Toxicity Values, which includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed.*

The EPA selected a Tier 1 toxicity value as the reference dose for noncancer effects. The reference dose for TCDD is 7E-10 mg/kg-day (EPA's Reanalysis of Key Issues Related to Dioxin, 2012). The noncancer toxicity value for TCDD was based on two epidemiologic studies that associated TCDD exposures with adverse health effects. The first study reports decreased sperm concentration and sperm motility in men who were exposed to TCDD during childhood during the Seveso accident (Mocarelli et al., 2008), and the second reports increased thyroid-stimulating hormone levels in newborns born to mothers who were exposed to TCDD during the Seveso accident (Baccarelli et al., 2008). Adverse health effects were observed in sensitive susceptible very young members of the population during their development in utero and identified the first 10 years of life as a critical window of susceptibility for TCDD induced sperm

effects in young children. IRIS also gives the confidence level associated with the toxicity value. The degree of confidence ascribed to a toxicity value is a function of both the quality of the individual study from which it was derived and the completeness of the supporting data base. IRIS gave a confidence level of "High" to the non-cancer toxicity value for dioxin. Toxicity values published in IRIS are classified as Tier 1 toxicity values and are preferred over other classified tiered toxicity values.

Currently there is no cancer toxicity value or slope factor for dioxin published in IRIS. However, EPA requires whenever possible to evaluate chemicals for both cancer and non-cancer effects for chemicals that exert these types of effects. Dioxin is known to have both cancer and non-cancer effects. Therefore, EPA evaluated the risk from both types of adverse health effects in its site specific baseline risk assessment. Complying with EPA's Dec. 5, 2003 directive, EPA used a Tier 3 cancer toxicity value in its cancer risk evaluation in the site specific risk assessment. EPA used the California EPA Cancer Slope Factor (CSF) for TCDD of 1.3E+5 (mg-kg-day)-1 (at Cal EPA's 2002 Air Toxics Hot Spots Program, Risk Assessment Guidelines, Part II, Technical Support Document for Describing Available Cancer Potency Factors. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA), Sacramento, CA). As a result of its evaluation, EPA relied on the Tier 1 toxicity value for noncancer effects in its decision regarding the risk and cleanup development for the Site, but not the cancer effects of dioxin. EPA included a discussion of the cancer effects in its risk assessment to show that by cleaning the site to the non-cancer effects level, EPA is also protecting for cancer effects.

2.3.65 Comment: A detailed refined analysis shows that the Preliminary Remedial Goals could be orders of magnitude higher than those proposed by Region 6 and still be protective of human health.

Response: *The risk-based remediation level was established at 30 mg/kg based on EPA policy and guidance. Other sites have had goals both lower and higher than that established for San Jacinto, but the final value selected is conservative and consistent with EPA guidance and also realistic.*

2.3.66 Comment: Region 6 also committed many scientific errors throughout the process of developing the Proposed Plan. Among them were failure to recognize that the dioxins and furans at the site have vastly different physicochemical and pharmacokinetic properties and an inaccurate analysis of the time that it could take dioxins and furans to degrade if they were allowed to naturally attenuate. These errors need to be corrected if there is to be a credible remedy for this site.

Response: *The risk assessment, upon which the remediation goal of 30 ng/kg was established, was based on exposures used in the original Baseline HHRA with some updates based on EPA guidance. Consistent with dioxin risk assessment procedures, the use of Toxicity Equivalency Factors (TEFs) for selected dioxin and furan congeners were used to generate 2378-TCDD Toxicity Equivalent Quotients (TEQs). The different physical and chemical characteristics associated with dioxin and furan congeners were not ignored. With respect to the degradation estimates it is true that there is a wide range of degradation half-lives, but the congeners associated with the site (primarily 2,3,7,8-TCDD and 2,3,7,8-TCDF) are both*

resistant to degradation. Further, regardless of if the residence time is more or less centuries, maintenance of a hardened cap over this time is unlikely to be successful given the propensity of the area to extreme weather events.

2.3.67 Comment: EPA Region 6 should withdraw the Principal Threat Waste concept and designation, select scientifically appropriate Preliminary Remedial Goals for the site, and seriously consider all of the proposed remedial alternatives using the National Contingency Plan criteria. All of this should be done in an open and transparent fashion, candidly discussing scientific and engineering uncertainties. Several EPA regions (3,4,8) have used alternative values for HIs in various Superfund decision documents. For example, EPA Region 3 has recently approved an Remedial Action Objective corresponding to HI=2, This language was first used in the Safe Drinking Water Act (SDWA) as a basis for setting Maximum Contaminant Levels and Maximum Contaminant Level Goals. It was not numerically defined in the SDWA or in CERCLA on the basis of toxicological uncertainty in an Reference Dose (US Army Corps of Engineers 2016). As will be seen below, there is substantial toxicological uncertainty in applying the 2,3,7,8-TCDD Reference Dose to the TEQs at the Site. On the basis of the logic used by Region 3, toxicological uncertainty alone could increase the SJRWP principal threat waste bright line from 300 ng/kg to 600 ng/kg. Region 4 (EPA 2014) specifically directs developing remediation goals with HQ of 3 based on statements regarding uncertainty made in RAGS A (EPA 1989). This would result in a principal threat waste bright line of 900 ng/kg. Another regulatory interpretation is that used by the Maryland Department of the Environment (MDE 2008) which is based on orders of magnitude values for hazard indices in analogy to the orders of magnitude for cancer risks noted in the National Contingency Plan. In fact, the MDE explicitly considers a hot spot as a site that exceeds a HI of 100. The concept of a hot spot is not substantially different than the concept of a principal threat. Based on this reasoning, the SJRWP bright line could easily take on a value of 3,000 ng/kg. This paragraph demonstrates that the uncertainty associated with a selection of a margin of safety for a non-carcinogen can result in a substantial variability and lack of reproducibility in the outcome. All of the values cited here incorporate an adequate margin of safety and are based on regulatory guidance and usage. All are fully documented and their application is transparent. As with all Superfund regulatory risk management decisions, the selection of an adequate margin of safety and subsequent value of a target hazard index depends on transparent and justified decision-making by the risk manager rather than arbitrary selection of a value.

Response: *EPA notes differences used by Regions 3 and 4 in selecting remedial goals. However, Region 6 has selected an HQ of 1 to be protective of human health and the environment for this site. Further, the uncertainty associated with the 2,3,7,8-TCDD Reference Dose is not sufficient justification for increasing the acceptable HQ at the site. The 2,3,7,8-TCDD Reference Dose was set based upon an uncertainty of 30 due to the use of a LOAEL (UF=10) and inter-individual variability (UF=3). The Reference Dose is set forth in IRIS and based upon epidemiological data with a degree of confidence ascribed as "High". Therefore, the remediation goals determined for the site are reasonable in their margin of safety and selected hazard index.*

2.3.68 Comment: One of the key criteria for a principal threat waste is a high degree of mobility. In the Proposed Plan, Region 6 has failed to demonstrate that the material in the

northern impoundments is highly mobile. In actuality, dioxin congeners are highly immobile and will sorb strongly to materials in the impoundments. A properly designed and maintained cap over the northern impoundments will prevent the mobility of the waste materials and any sorbed PCDD/F congeners.

Response: *EPA concurs that the temporary cap has reduced mobility of the dioxin/furan wastes, however there have been numerous failures and repairs of the cap. In the event of a not unexpected catastrophic hurricane even a hardened cap is likely to fail based on modeling of the enhanced cap (Alternative 3N). The fingerprint assessment has demonstrated that wastes from the impoundments have expanded beyond the limits of the impoundments, and a major release could easily occur upon failure of a cap. The dioxin/furan congeners of concern (those with TEFs) are not typically considered mobile as dissolved constituents in surface water or porewater. However, they are known to bind to fine grained sediments that could be mobilized over a large area in the event of cap failure, which is not an unreasonable scenario given the dynamic nature of the San Jacinto River. The US Army Corps of Engineers has demonstrated that Alternative 6N provides a more certain, quantifiable outcome than Alternative 3N, with lower overall potential for release of mass. This is especially true given the additional best management practices planned for removal. EPA maintains that the use of an armored cap will be inadequate to contain the pulp waste over the long-term.*

2.3.69 Comment: One of the general criteria for a principal threat waste is a characterization of highly toxic. The guidance and some precedent goes on to state that a lifetime excess cancer risk exceeding 10^{-3} can be used to give general support to that characterization. The highest cancer risk found in Region 6's risk assessment (Khoury, 2016a) was 6.6×10^{-4}, thus the guidance threshold value of 10^{-3} was not exceeded and the cancer risk failed to meet the criterion. EPA Region 6 then opted for alternative methods to attempt to demonstrate high toxicity including applying an arbitrary safety factor to a PRG that, itself, did not reflect a reasonable maximum exposure.

Response: *The guidance and some precedent goes on to state that a lifetime excess cancer risk exceeding 10^{-3} can be used to give general support to the principle threat waste characterization. The lifetime excess cancer risk exceeding 10^{-3} is one order of magnitude or a factor of 10 higher than the EPA acceptable upper end of the cancer risk range of 10^{-4}. The sediment remediation goal is based on non-cancer effects. Therefore, one order of magnitude or a factor of 10 greater than the EPA's acceptable level for non-cancer effect is applied here. EPA in its evaluation of risk from exposure to dioxin at the San Jacinto River Waste Pits site considered the scientifically verified and peer reviewed highly toxic value of dioxin for noncancer effects. The toxicity value or reference dose developed for tetrachlorodibenzo-p-dioxin was published in the EPA Integrated Risk Information System (IRIS) and is based on real human epidemiological data. IRIS gave a confidence level of "High" to the non-cancer toxicity value for dioxin. EPA is still developing the cancer effects toxicity value from dioxin exposure and currently there is no cancer toxicity value or slope factor for dioxin published in IRIS. EPA requires whenever possible to evaluate chemicals for both cancer and non-cancer effects for chemicals that exert these types of effects including dioxin/furan. Therefore, EPA evaluated the risk from cancer using a tier 3 cancer toxicity value. EPA relied on the tier 1 toxicity value for non-cancer effects in its decision regarding the site and included the cancer effects to show that*

by cleaning the site down to the non-cancer effects level, EPA is also protecting for cancer effects.

2.3.70 Comment: Region 6 has invented a generic hypothetical compound that they designate as a "TEQ" and to which they ascribe the physicochemical and pharmacokinetic properties of 2,3,7,8-TCDD. As shown in Figure 1, the predominant PCDD/F congeners at the site are OCDD and 2,3,7,8-TCDF, however, the chemical-specific parameters used in Region 6's calculations were all only based on 2,3,7,8-TCDD properties assigned to the hypothetical "TEQ". This introduces a significant amount of error in the use of these PRGs for any chemical other than 2,3,7,8-TCDD and obviates the use of the PRGs either to derive cleanup goals or to characterize PTW unless they are limited to application to 2,3,7,8-TCDD.

Response: *The use of the TEQ to represent dioxin/furans is standard methodology set forth by EPA (EPA 2010, 2013). Because the PRGs were risk-based, the use of the TEQ is an appropriate method when assessing dioxins/furans. A review of the summary statistics for dioxins/furans from the Remedial Investigation Report reveal that 2,3,7,8-TCDD is a primary contributor to the TEQ concentrations in sediment and fish tissue (Anchor 2013). Therefore, the use of the TEQ does not introduce a "significant amount" of error because 2,3,7,8-TCDD is a primary contaminant of concern.*

2.3.71 Comment: A sensitivity analysis performed by CPF Associates identified several exposure factors used by EPA Region 6 (Khoury 2016a) to develop the preliminary remediation goal as being responsible for much of the uncertainty in these calculations. In addition to toxicity, the biota-sediment accumulation factor (BSAF) was found to be highly important. Other important exposure factors include the fraction ingested from the site (FC), soil adherence factor (AF), skin surface area (SA), sediment ingestion rate (IRSc) and exposure event time (which was erroneously not considered by EPA Region 6). Each of these factors has associated scientific uncertainty and they combine in ways to propagate and magnify uncertainty in the preliminary remediation goal calculation. Ultimately, this combination of uncertain exposure factors represents a scenario that reflects a virtually impossible, rather than a reasonable maximum, exposure scenario.

Response: *The exposure factors used by EPA Region 6 were taken directly from the BHHRA (Integral 2013), except for body weight and lifetime cancer averaging time. All exposure factors used were consistent with other national risks assessments and are reflected in the 2016 Regional Screening Level Calculator. The issue of BSAF has been discussed in previous comment responses.*

2.3.72 Comment: It is highly unusual for a site to have a preliminary remediation goal based on an indirect exposure pathway such as sediment→fish→human due to the uncertainties in the linkages. The preliminary remediation goal for this pathway, which dominates the overall preliminary remediation goal for sediment, involves selection and application of BSAFs that can link the amount of a PCDD/F congener in sediment to the concentration in edible fish or shellfish. The BSAF used by EPA Region 6 to calculate the preliminary remediation goal that is used to characterize principal threat waste suffers from several deficiencies including: 1) failure to demonstrate a complete pathway, 2) failure to use congener-specific data, 3) use of a generic

rather than site-specific BSAF, 4) use of the same BSAF for fish and shellfish, and 5) failure to transparently inform the public of the uncertainties in the BSAF and how it impacts the calculation of the preliminary remediation goal. The many problems associated with Region 6's application of the BSAF concept are puzzling in light of the fact that EPA's National Health and Environmental Effects Research Laboratory is internationally acknowledged to be a center of excellence regarding BSAFs. For example, EPA scientists at this center led by Burkhard et al. (2004) clearly show the relationship between BSAFs and Log Kow values which was not used by Region 6. In another publication, Burkhard et al. (2010) estimated the errors in translating BSAFs across species and across and within sites and found 90th percentile errors from 5.1X to 12X using actual empirical (not default) data. Finally, this lab at EPA has developed a large (over 10,000 entries) database of BSAF values which is available on-line as an interactive MS Access document. The database contains information for the various congeners, finfish and shellfish species, and types of water bodies. As an example of its contents, a quick search by CPF revealed 27 entries for BSAFs for 2,3,7,8-TCDF in estuarine waters. These data could have been further sorted to identify fish species in the San Jacinto River (or analogous closely-related species) that are potentially consumed by local fishers. Despite the existence of this center of excellence, Region 6 opted to not avail itself of these resources and use a single default value of dubious provenance for BSAF.

Response: *The site specific BSAFs were not used because they varied over orders of magnitude, and were determined to be unreliable. Appendix B of the Remedial Investigation, specifically states that the Site-specific BSAF would "generate unreliable results" due to the high variability of the site specific BSAF data. Therefore, the EPA did not use the site specific BSAF values developed by the PRPs. EPA was transparent and provided justification for the use of a BSAF value provided in the EPA Combustion guidance (US EPA, 2005). EPA's Combustion Guidance BSAF value of 0.09 pg/g tissue per pg/g sediment for calculating the sediment PRG value was judged to be reasonable, and the derivation of the BSAF is provided in detail in US EPA (2005).*

2.3.73 Comment: Integral/Anchor (2010, 2013) performed a detailed literature review analysis of bioaccumulation of PCDD/Fs in the SJR. This analysis concluded that "the majority of dioxin and furan congeners do not consistently accumulate in fish or invertebrate tissue". Integral reached these conclusions by sampling both biological tissue and sediment and subjecting the results to statistical analysis using Kendall's non-parametric rank correlation procedure. Note that, appropriately, no values were developed or analyzed for TEQs, but only for individual congeners. Of all the congener relationships in this dataset, only 5 (29%) were statistically significant at a 95% level of confidence (marked in bold). This means that any apparent relationship between sediment concentrations and fish tissue concentrations for the other congeners could be explained as random chance or statistical noise. Even those pairs with statistically significant relationships had very weak relationships. Kendall's tau-b is a non-parametric correlation coefficient that is conceptually similar to Pearson's product moment correlation coefficient for parametric analysis. A value of zero indicates that there is no relationship between the variables, a value of +1 indicates the maximum positive relationship between the variables and a value of -1 indicates the maximum negative relationship between the variables. Of the variables with a statistically significant relationship, one (OCDF) had a negative relationship suggesting that the occurrence of higher OCDF values in sediment were

associated with lower OCDF values in fish. The remaining four congeners had weak Kendall's tau values (ranging from 0.144 to 0.449) strongly suggesting that some other, currently unidentified, variable or variables had stronger associations with congener levels in fish than did sediment levels. Thus, a site-specific analysis showed only weak relationships between a few dioxin congeners in sediment and those in fish. This certainly implies a lack of a complete pathway even from sediment to fish.

Response: *The preliminary remedial goal (PRG) of 30 ng/kg was established based on incidental ingestion of and dermal contact with sediment as well as the ingestion of fish. Site-specific data were used, including site-specific fish concentrations. Additionally, the fingerprint analysis of the site showed that 2,3,7,8-TCDD and -TCDF were the primary dioxin/furan congeners associated with the pulp waste, not OCDD or OCDF (which has a very low TEF anyway). It is not surprising that some congeners show smaller bioaccumulation factors, either due to selective degradation within the organism or size exclusion for the larger congeners. However, because the PRG (and subsequent Principal Threat or remedial goal establishment) are based on multiple exposures (sediment and fish), and the use of site-specific data to establish the PRG, these factors have been accounted for.*

2.3.74 Comment: The decision to base the principal threat waste determination on fish ingestion is particularly perplexing given that Region 6 apparently believes that the problem with fish is not PCDD/Fs but PCBs. Turner (2016) noted that fish PCDD/F concentration levels were already "so close to background" and that "the advisories are likely to remain in place primarily due to PCBs. Although dioxins can be found throughout the watershed, PCBs are more prevalent."

Response: *The principle threat waste determination is based upon the preliminary remediation goal for sediment that takes into account ingestion of sediment, dermal contact with sediment, and fish ingestion. Further, while PCBs may be more prevalent, the site presents a potential risk concern for human health and the environment due to dioxins/furans. It is unreasonable to make the assumption that cleanup is not warranted for the site just because PCBs are more prevalent in the watershed. The memo from Turner (2016) does note that PCBs are more prevalent in the watershed; however, the memo also notes that TCDD is also present and the site is the primary contributor to TCDD in the watershed. Further, the memo states that removal of the dioxins/furans from the site will result in a risk reduction from consuming fish surrounding the site.*

2.3.75 Comment: Region 6's inappropriate reliance on physicochemical and pharmacokinetic properties of a hypothetical "TEQ" compound rather than congener-specific data permeates their PRG calculations. With the possible exception of the reference dose, nowhere is this more problematic than the use of TEQs with BSAFs. Congener-specific effects on bio-uptake of PCDD/Fs into fish have been known since the mid-1980s. Region 6 (Khoury 2016b) explicitly acknowledges this. Quoting extensively from ATSDR (1998), "Measurements of the bioconcentration of CDDs tend to increase with the degree of chlorination up to TCDDs and then decrease as chlorination continues to increase up to the OCDD congeners. The more highly chlorinated congeners, such as OCDD, appear to have the lowest bioconcentration potential either because they are less bioavailable because of their rapid adsorption to sediment particles or

because of their large molecular size". Despite this, Region 6 went on to assume that a BSAF for 2,3,7,8-TCDD was appropriate to be applied to all congeners.

Response: *The fingerprinting exercise demonstrated that the primary dioxin/furans at this site are 2,3,7,8-TCDD and 2,3,7,8-TCDF. Higher and lower chlorinated dioxin/furans contributed to total dioxin and furans, but did not dominate. Consequently, the use of the 2,3,7,8-TCDD BSAF is entirely appropriate because it (and the furan correlative 2,3,7,8-TCDF) are not only the most toxic, but also the most prevalent in pulp waste. In general, both the toxicity and bioconcentration potential of dioxins increase with their hydrophobicity, with TCDD having a high toxicity and high bioconcentration factor. The use of TEFs adjusts for differences in toxicity between dioxin congeners in comparison to TCDD. Given the co-relation of hydrophobicity, toxicity, and bioconcentration potential, the TCDD bioconcentration factor can be applied to the total TCDD TEQ as a general estimate of overall accumulation.*

2.3.76 Comment: Region 6 appears to base its judgements regarding the time over which a cap may need to be stable on the degradation rates of PCDD/Fs. In the Feasibility Study (EPA 2016c), Region 6 states, "Dioxins/furans are highly persistent chemicals and will not break down for hundreds of years. While there is considerable uncertainty regarding biodegradation of dioxins/furans, Region 6 estimates that, for dioxins that are not exposed to sunlight the dioxin half-life ranges from 25 to 100 years." Region 6 (Khoury 2016c) then proceeds to take the upper end of this range to estimate that it would take between 450 years and 750 years for the "dioxin" in the sediment to reduce from a putative 40,000 ppt to various proposed cleanup levels. The origin of the half-life range is obscure at best and misleading at worst. Region 6 cites to EPA's Clu-In website, but that site merely restates what Region 6 wrote in the Feasibility Study. In a memorandum, Region 6 (Khoury 2016c) notes that his source of information was ATSDR's 1998 Toxicological Profile for dioxin, a secondary and almost 20-year old source, which cited to a statement made by Paustenbach et al. (1992) who derived it from documents dealing with risk assessment rather than environmental fate. Nonetheless, as originally developed it clearly was a default value that only applies to 2,3,7,8-TCDD in subsurface soil rather than to a variety of congeners in sediment. If we assume that all 40,000 ppt "dioxin" is 2,3,7,8-TCDD (consistent with Region 6 usage) and use the data from Kim et al (2009) in this formulation, we find that it will take only 74 years for the cleanup level of 220 ppt noted by Region 6 (Khoury 2016c) to be attained rather than the 750 years predicted by Region 6. One of the reasons for this large difference is Region 6's tacit assumption that 2,3,7,8-TCDD is being totally mineralized rather than being degraded to the non-toxic TCDD products.

Response: *As noted in several comment responses, based on the fingerprinting exercise the primary dioxin and furans found in the waste are the 2,3,7,8-TCDD and TCDF congeners. Consequently, using the TCDD as a surrogate for determining the half-life is appropriate. While it is acknowledged that estimates of half-lives of TCDD (or any other organic compound) are difficult, and range often by orders of magnitude, it has to be acknowledged that dioxins and furans are long-lived and persistent in the environment. EPA maintains that the use of an armored cap will be inadequate to contain the pulp waste over the long-term. Whether that long-term is 100 or 500 years, it is more likely years or at most decades before a major hurricane hits the area with the potential of significant damage to a cap and release of the*

dioxins and furans in the pulp waste to the surrounding environment. Removal of the pulp waste (Alternate 6N) was therefore selected as the appropriate remedial action.

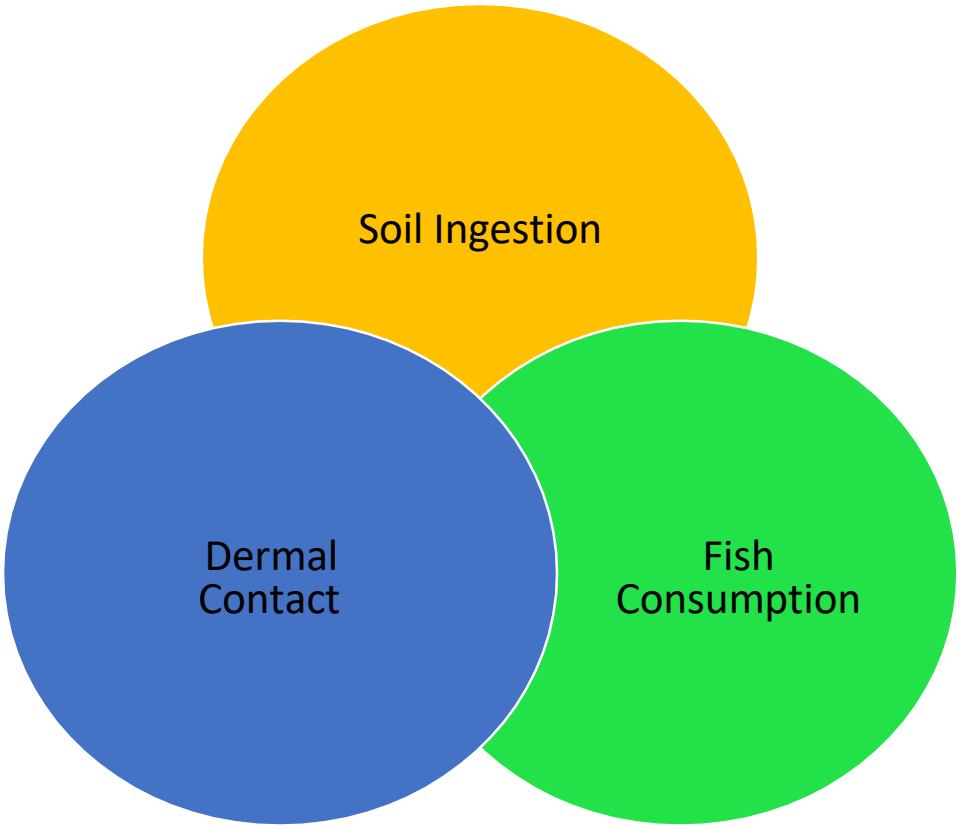
2.3.77 Comment: The US Army Corps of Engineers concluded that over a 500-year period, Alternative 3N is predicted to release between 0 mg (sic) and 2.18 mg of 2,3,7,8-TCDD depending on the input assumptions used. On the other hand, Alternative 6N could release between 3 x 10-16 mg and 10,200 mg of 2,3,7,8-TCDD, again depending on the inputs used.

Response: *Releases for Alternative 6N are at the low end of the range (i.e. $3x10^{-16}$ mg) when best management practices are used, and are subject to a higher degree of certainty than those for Alternative 3N. The release estimates for Alternative 3N above are only valid if there is no major disturbance of the cap, which could result in significant release.*

2.3.78 Comment: The lower release values for some Alternative 6N scenarios are contingent on the successful operation of best practices that have yet to be defined. The US Army Corps of Engineers' suggested best practices for placement involve "carefully placing the sand material in two equal layers which considerably reduces mixing with the contaminated materials and resuspension. This results in the top 6 inches of material, including the mixed layer, remaining clean and increasing the barrier between the contaminated residuals and the water column". The US Army Corps of Engineers shows the depth of the mixed layer as 10 cm (3.9 inches), two sand layers of 5 cm and 15 cm (2 and 5.9 inches) and a residual layer of 3 cm (1 inches), each with prescribed porosities and TOC content. The idea of heavy equipment operating over a large area in an uncertain environment with the precision needed to attain this specification precision in practice is a laudable goal, but probably not attainable in the field. Insofar as other best practices, the US Army Corps of Engineers has stated "it will be necessary to prepare a contingency plan as part of the Remedial Design in order to develop best practices to prevent, contain, or manage such release." The US Army Corps of Engineers does caution us, however, that "it may be necessary to conduct the work by removing only small portions of the cap at a time, and provide cover for any residuals before starting the next area" which may be considered to constitute a best practice, albeit one that adds complexity and uncertainty to the efficacy of the remedy. In general, however, no mention is given regarding the content of these desired best practices including quality assurance/quality control, performance goals, or consistency with standards.

Response*: EPA recognizes the limitations in construction practices as suggested in the comment. Consideration of the complexity, controls, and uncertainty of the efficacy of the remedy using commonly used removal approaches has led to the decision that removal would be best performed in the "dry" within a cofferdam. The approach reduces the complexity of staging and phasing of best management practice controls, cap removal, waste removal, and residuals management in an incremental manner throughout the site and reduces the need for precision construction for residuals management. Quality assurance/quality control, performance goals, or consistency with standards are topics to be addressed in the Remedial Design and work plan. These topics are standard components of all remediation projects. Acceptance criteria will be established target depth, residuals management, emissions, effluent quality, production, water management, containment, site closure, and other items.*

2.3.79 Comment: EPA policy and guidance (EPA 1989, RAGS A4) states that "actions at Superfund sites should be based on an estimate of the reasonable maximum exposure (RME) expected to occur under both current and future land use". EPA continues that, if a population is exposed by more than one pathway, the combination of exposures across pathways also must represent an RME. For decades, it has been clear from this and other guidance and regulatory decisions that the RME should be plausible and well within the range of possibilities, i.e., it does not represent an extreme worst case. The PRGs calculated by Region 6 (Khoury 2016a) are based on a child from birth to six years of age simultaneously inadvertently ingesting sediment, dermally contacting sediment over a majority of his/her body surface area, and ingesting a large amount of fish solely from isolated areas of the site. In all of these calculations, the hypothetical child is assumed to be contacting sediment contaminated with chemicals of concern at a concentration representing the 95% upper confidence limit (UCL) on the mean. The overall PRGs calculated by Region 6 can be conceptually represented by a classical Venn diagram in which the exposure scenario is represented by the area of overlap of the three circles:



In the Venn diagram, each circle can be taken to represent the proportion of the population exposed or, alternatively, the probability of exposure. Each one of these alone (individual circles) is a very low probability event (EPA 2011a, Gephart et al. 1994) and, in combination, the probability of them simultaneously occurring (area of overlap) approaches the infinitesimal.

Response: *EPA Risk Assessment is a process that EPA follows to be consistent in developing risk assessments across the nation. One such consistency factor is the definition of a young child. A young child exposure is here defined as six years of exposure. This is important for a young child exposed to dioxin (2,3,7,8-TCDD as TEQs) since non-cancer or systemic effects was*

observed in neonates and in young children during their first ten years of life. EPA uses the concept of "reasonable maximum exposed" (RME) individual to develop risk assessments. The RME exposure include both average values and upper end values. That is why for soil ingestion and dermal contact an exposure frequency of 39 days per year was used. The 39-day exposure frequency was adopted from the PRP's site specific baseline human health risk assessment. For fish ingestion 350 days per year was used since the annualized average daily fish ingestion rate is used. We don't use time spent in hours at the site since soil ingestion rate is based on a daily basis (i.e. mg/day). Body weight, skin surface area and ingestion rates are average values and exposure frequency and exposure duration tend to be upper end values. EPA used both average values and upper end values in the same equation to define the RME individual. The RME based calculation was then used in the development of the site specific PRP's baseline human health risk assessment and by EPA's PRG development for the San Jacinto River site as recommended in EPA risk assessment guidance (RAGS part A). As noted in several comments, exposure parameters, as well as exposure concentrations are the same as those used in the Baseline Risk Assessment, with the exception of the child body weight and lifetime (which were based on EPA guidance). EPA strives for conservativeness in the derivation of risks, which result in PRGs that are protective of the most sensitive receptors.

2.3.80 Comment: The development of these PRGs is far from transparent and has not been documented to the degree contemplated by RAGS B guidance. In addition, there is no justification for the process used to derive the preliminary remediation goals nor evidence that they were modified throughout the Superfund process to reflect the intent of the National Contingency Plan or RAGS B. Most important, there is no justification for the use of a preliminary remediation goal to define the principal threat waste with or without the application of an arbitrary safety factor.

Response: *The PRGs were modified and documented in both the PRP's baseline human health risk assessment and in the EPA's addendum risk and PRG values for site specific exposure scenarios. EPA had to decide whether a cleanup level should be developed for a subsistence fisher scenario or go with a recreational fisher scenario. There were reports that some people may be subsistence fisher but EPA could not confirm these reports. So, EPA first modified the type of receptors involved. The other modification was to look at frequency of exposure and ingestion rates. As recommended by RAGS part B, EPA relied upon the PRP's BHHRA to reflect a site specific exposure scenarios and used site specific exposure frequency of 39 days/year for dermal and soil ingestion and site specific annualized average fish ingestion rate of 14 g/day and 30 g/day respectively for a child and adult fish ingestion rates. EPA also modified the fraction of fish ingested from contaminated site and used 25 percent instead of 100 percent. All these modifications are clearly documented in the risk assessment documents for the site. With respect to the derivation of the principle threat waste please see the response to Comment 2.3.27.*

2.3.81 Comment: The Remedial Investigation Report and related documentation (Integral/Anchor 2013a, Anchor 2016) developed a series of protective concentration levels (PCLs). Although this report used different nomenclature (PCL vs PRG), the intent was obviously to satisfy the NCP requirement for PRGs. The Remedial Investigation authors presented PCLs for a hypothetical recreational visitor and hypothetical future construction worker based on plausible present and future land use considerations. The assumptions

underlying the calculations of these PCLs were fully explained in the Region 6 approved Remedial Investigation Report and in subsequent letters from Anchor QEA to Region 6 (Anchor 2013, Anchor 2016) and the uncertainties were characterized in the baseline human health risk assessment (BHHRA) (Integral/Anchor 2013b). These PCLs were summarily rejected by Region 6 in the Feasibility Study without explanation, however, our review shows these PCLs fulfilled the NCP requirements for PRGs and could have been readily used to inform the remedy selection process.

Response: *EPA did not reject or ignore the PCLs developed by the PRPs in the Remedial Investigation. On the contrary, EPA used the information and input parameters used for the PCL development in the Remedial Investigation and modified where EPA found it necessary either to be consistent with EPA guidance or based on site specific information. For example, EPA used recreational fisher scenario instead of subsistence fisher scenario which was used in the PRP's PCL development. EPA also made changes in the use of relative bioavailability for dioxin of 0.5 as was used by the PRP and replaced it with a factor of 1 instead as recommended by EPA.*

2.3.82 Comment: Region 6 apparently believes that PRGs or final Remedial Action Objectives for chemicals with systemic non-carcinogenic effects need to be set at a hazard index (HI) of HI=1. Although this frequently may be the case, it is not required by statute, regulation, policy or guidance. The NCP [§ 300.430(e)(2)(i)(A)(*1*)] states, "For systemic toxicants, acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety". The NCP gives no further direction regarding the definition of an "adequate margin of safety" and does not define a numerical goal for achieving this margin. In RAGS B, we see that EPA has directed that the "total risk for non-carcinogenic effects is set at an HI of 1 for each chemical in a particular medium" when developing a PRG, however, gives no direction how this should be translated into an Remedial Action Objective.

Response: *The "Role of Baseline Risk Assessment in Superfund Remedy Selection Decision"; OSWER Directive 9355.0-30 April 22, 1991 states the following: "For non-carcinogenic effects of toxicants, unacceptable risk occurs when exposures exceed levels which represent concentrations to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, …" This translates to a HI of 1 which is defined as the ratio of average daily intake in milligrams of chemical per day per kilogram body weight divided by the reference dose (RfD) in milligrams of chemical per day per kilogram body weight developed based on toxicity studies or epidemiological studies identified in the published literature.*

EPA follows this guidance in protecting human health. Especially for very toxic chemicals such as dioxins and furans which human epidemiological studies have shown that observed adverse health effect such as endocrine disruption effects on the most sensitive subgroup of the population (young children and developing fetus) did occur and determined the lowest concentration at which these adverse health effects were observed. These epidemiological studies indicated that there is no room to accept higher hazard index levels. For the San Jacinto

River site, reducing the margin of safety by increasing the acceptable HI by a factor of 2 or 3 would increase the probability of observing toxic effects in the most susceptible group of the population and is considered professionally and morally unacceptable.

2.3.83 Comment: The concept of uncertainty in environmental decision making is key to developing a remedy for this site. By failing to acknowledge uncertainty, Region 6 implies that all the elements of its Proposed Plan, from preliminary remediation goals to principal threat waste designation to analysis of short-term effectiveness, are certain which can convey a false sense of security to the public. In addition, the failure to incorporate uncertainty into risk management means that Region 6 has lost a valuable tool for evaluating and managing the site (Maier 2008). It should be noted that a formal uncertainty analysis was undertaken in the BHHRA, however, Region 6 did not avail itself of this analysis in developing the proposed plan nor did it undertake any uncertainty analysis in its own risk assessment or PRG calculations (Khoury 2016a, b).

Response: *The risk assessment and preliminary remediation goal calculations done by EPA is an addendum to the BHHRA (Integral, 2013) prepared for the site. EPA used the same site specific information such as exposures input parameters as was used by the BHHRA except for general input parameters that are used for child body weight and averaging time. Therefore, all the uncertainties mentioned in the BHHRA, which were properly reported in the uncertainty section of the BHHRA, also applies to the risk assessment and PRG done by EPA.*

2.3.84 Comment: It should be apparent to the reader that a fatal flaw in Region 6's preliminary remediation goals calculations was the assumption that all PCDD/F congeners behave identically to 2,3,7,8-TCDD and each other in the environment and in living tissue of human and aquatic life. If the TEQ concept was to be used in these calculations, it should have been applied to the concentrations of the individual congeners in the target tissue and not to concentrations of congeners in the environment. Alternatively, the preliminary remediation goals and principal threat waste definition may be applied only to 2,3,7,8-TCDD concentrations in the environment, all other things being equal. This would result in the determination that there was little if any PTW at the Site.

Response: *The San Jacinto River waste pits dioxin finger print indicates that the waste is dominated by the presence of the most studied and most highly toxic chemical of all congeners 2,3,7,8-TCDD and by 2,3,7,8-TCDF. Therefore, the risk will also be dominated by these two congeners. EPA's recommendations to evaluate risk from dioxin and dioxin like compounds (EPA, May 2013) Use of Dioxin TEFs in Calculating Dioxin TEQs at CERCLA and RCRA sites fact sheet):* https://semspub.epa.gov/work/HQ/174558.pdf *"The evaluation of dioxin (TCDD) and dioxin like compounds (DLCs) at CERCLA and RCRA sites includes consideration of the toxicity (i.e., cancer risks and non-cancer effects) of these contaminants. In the absence of toxicity values for DLCs, TEFs are used as a measure of the toxicity of the DLCs relative to TCDD. Concentrations of DLCs measured in media are modified by TEFs to determine the dose of each DLC in a medium that is equivalent to a dose of TCDD. The modified DLC doses are expressed in terms of TCDD toxicity equivalence (TEQ). The DLC TEQ concentrations are used, rather than the DLC concentrations measured in media, for site evaluations including site characterization, risk assessment, cleanup level development and confirmatory sampling."*

The TEF approach is based on the concept of dose addition, under which it is assumed that the toxicokinetics and toxicodynamics for all DLCs are similar, and that the DLCs act by a common toxic mode of action (i.e., for all DLCs, effects are mediated through aryl hydrocarbon receptor binding). Further, this approach assumes that toxicological interactions do not occur among the DLCs within the environmental mixtures being assessed (e.g., synergism and antagonism do not occur).

EPA understands that there are uncertainties associated with the application of TEF approach. However, EPA currently believes that the TEF approach is a reasonable approach to take in addressing risk from exposure to mixtures of dioxin and DLC wastes. This approach has national and international scientific consensus in evaluating sites contaminated with dioxin and DLCs.

2.3.85 Comment: A sensitivity analysis performed by CPF Associates identified several exposure factors used by EPA Region 6 (Khoury 2016a) to develop the PRGs as being responsible for much of the uncertainty in these calculations. In addition to toxicity, the biota-sediment accumulation factor (BSAF) was found to be highly important. Other important exposure factors include the fraction ingested from the site (FC), soil adherence factor (AF), skin surface area (SA), sediment ingestion rate (IRSc) and exposure event time (which was erroneously not considered by EPA Region 6). Each of these factors has associated scientific uncertainty and they combine in ways to propagate and magnify uncertainty in the PRG calculation. Ultimately, this combination of uncertain exposure factors represents a scenario that reflects a virtually impossible, rather than a reasonable maximum, exposure scenario.

Response: *Based on EPA guidance (RAGS Part A) actions at Superfund sites should be based on an estimate of the reasonable maximum exposure (RME) expected to occur under both current and future land-use conditions. The reasonable maximum exposure is defined here as the highest exposure that is reasonably expected to occur at a site.*

The guidance also provides information on how to determine the RME at a site and identifies some exposure variable values appropriate for use in this determination. The specific values identified is regarded as general recommendations, and could change based on site-specific information and the needs for the project management of the site.

The discussion of uncertainty is a very important component of the risk assessment for the site. Based on the sources and degree of uncertainty associated with estimates of exposure, the decision-maker evaluates whether the exposure estimates are the maximum exposures that can be reasonably expected to occur. The potential magnitude for over-estimation, under-estimation or over or under estimation of exposure is reported.

The Baseline Human Health Risk Assessment prepared by the PRPs used default exposure values recommended by the guidance and made changes where defendable site-specific values were available. It also addressed sources of uncertainties and their impact on the risk assessment. They were reported in details in Section 6.2.3, page 6-14 of the PRPs' Baseline Human Health Risk Assessment. This all was done as required and in accordance with recommendations of EPA risk assessment guidance. EPA Region 6 utilized most of these exposure factors, and

slightly modified some exposure factors such as exposure duration that have been discussed elsewhere.

2.3.86 Comment: Integral/Anchor (2010, 2013) performed a detailed literature review analysis of bioaccumulation of PCDD/Fs in the SJR. This analysis concluded that "the majority of dioxin and furan congeners do not consistently accumulate in fish or invertebrate tissue". Integral reached these conclusions by sampling both biological tissue and sediment and subjecting the results to statistical analysis using Kendall's non-parametric rank correlation procedure….
It is not sufficient to merely assert that there is a human receptor at the end of an exposure pathway; this must be demonstrated using scientific evidence (Chrostowski 1994). In order to provide this evidence, the next step of the pathway analysis would have been to analyze PCDD/Fs in potential receptors. Serum or plasma PCDD/F measurements are commonly performed in environmental health studies (ATSDR 1998). If the chemical profile (fingerprint) of PCDD/F congeners in a human population matches that in the fish, the fish ingestion pathway would be deemed to be complete. This evidence is particularly important given that PCDD/Fs are ubiquitous in the human population and have an almost infinite number of sources. No such data were obtained for hypothetical fish consumers at the SJRWP Site. The results of the statistical analysis plus the absence of human body burden analysis strongly argue against a complete exposure pathway for human exposure to sediment from consumption of fish.

***Response*:** *A human health risk assessment is the process to estimate the nature and probability of adverse health effects in humans who may be exposed to chemicals in contaminated environmental media, now or in the future. The human health risk assessment cannot predict which individuals will end up with disease or predict the body burden of dioxin in their blood. For an exposure to be a complete pathway, there should be a source of contamination, a specific migration pathway carrying contaminants to a receptor and a receptor. A site-specific conceptual site model (CSM) is developed to help in identifying complete exposure pathways. The PRP's risk assessment identified ingestion of fish by an individual as a complete pathway. Section 5.1.1 of the baseline human health risk assessment prepared by the PRPs says the following: "Based on the CSM for the area north of I-10 and aquatic environment, the following potential exposures were quantified for these hypothetical receptor groups:*

• Recreational Fisher—direct contact (incidental ingestion and dermal contact) with sediment and soils, ingestion of finfish, and ingestion of shellfish
• Subsistence Fisher—direct contact (incidental ingestion and dermal contact) with sediment and soils, ingestion of finfish, and ingestion of shellfish
• Recreational Visitor—direct contact (incidental ingestion and dermal contact) with sediment and soils."

EPA does not wait until an adverse health impact occurs to take action. EPA can use existing information (e.g. dioxin in serum blood or lead in blood) to supplement its decision regarding the site. EPA uses its human health risk assessment processes and methods to evaluate potential for exposure and the probability for adverse harm. Then uses this information in its decision to clean up contaminated environmental media to achieve its goal of protecting human health and the environment.

2.3.87 Comment: EPA Region 6 selected and applied a generic BSAF of 0.09 to calculate the PRGs for the SJRWP Site (Khoury 2016a,b). The value of 0.09 was cited to EPA's 2005 Combustion Guidance. These BSAFs ultimately came from EPA's (2000) dioxin reassessment and are based on an assumed fish lipid content of 7% and a sediment organic carbon content of 3% and fish species which may or may not be relevant to the SJRWP Site[14]. It should be noted that even EPA (2000) recommends different values for different homolog classes – hexa-CDD/Fs, hepta-CDD/Fs, and OCDD/F which were not used by Region 6 in development of the PRGs despite the relevance of these homologs. The rationale for Region 6's reliance on this value despite the existence of some site-specific values reported by Integral and the large database available from EPA (2003) is not apparent.

Response: *Two site specific studies were performed to develop BSAF values, neither of which were consistent with EPA protocol for developing BSAF. The authors of these two studies in their conclusions recommended against using their BSAF values for setting remedial goals or for risk assessment. The PRP Integral report found that the derived BSAFs were unreliable and inadequate for back calculation of acceptable sediment concentrations. The Baylor study came up with a BSAF value for fish of 0.044 pg/g tissue per pg/g sediment and indicated that the methodology utilized may lead to low BSAFs and were not appropriate for the setting for remedial goals.*

Because of the lack of reliable site specific information to use a BSAF value which would be acceptable in the risk assessment or in developing remedial goals, EPA relied on the BSAF provided in the combustion guidance. The Combustion guidance BSAF value of 0.09 pg/g tissue per pg/g sediment is a reasonable value based on studies in the published literature. It was developed using proper EPA protocols and is consistent with guidance and with other dioxin contaminated sites. It was based on data collected from Lake Ontario and from data in Passaic River for water column feeders such as trout as referenced in EPA's 2005 Combustion Guidance.

2.3.88 Comment: In calculating PRGs, Region 6 (Khoury 2016a) failed to take into account the time over which exposure could occur… This is an illustration of an unreasonable maximum exposure. At the very least, Region 6 should have taken the time course of absorption into account in calculating the PRGs.

Response: *Equations for soil/sediment ingestion, dermal and inhalation for a recreational child exposure scenario used by the scientific community in the whole nation in developing PRGs or risk assessments for Superfund sites. The equations can be found on the RAIS web page or EPA guidance. Exposure time for ingestion and dermal contact with soil/sediment are not part of the equations because the time of exposure is incorporated in the ingestion rate or dermal contact. Intake rates represent long-term average daily values based on ingestion rates and body weight (e.g. mg/kg-day). Exposure time is considered and evaluated in the equation for inhalation exposure to be consistent with the Inhalation Dosimetry Methodology, which represents the Agency's current methodology.*

2.3.89 Comment: It should be noted that the value of 0.03 for ABSd is obsolete. Newer data developed from EPA-sponsored research shows this value to be between 0.0024 for high organic soil and 0.019 for low organic soil (Roy et al. 2008). Data presented in the Remedial Investigation show that the total organic carbon in SJRWP Site sediments is between the low and high values from Roy et al. (2008), thus an accurate dermal absorption coefficient would also be between these values and should be used for any calculation of PRGs.

Response: *In the absence of site-specific chemical specific information, EPA recommends that default values for the ABSd parameter be used when calculating RME soil exposure. These defaults are presented in order to facilitate performance of risk assessments by compiling these factors in one place, and to promote consistency in risk assessment. The range of absorption was reported to be 0.1 percent to 3 percent in the dermal guidance (RAGS Part E). EPA recommends accepting the three percent value as a conservative assumption of ABS for chlorinated dioxins, in accordance with RAGS. The use of conservative assumptions is appropriate when determining Reasonable Maximum Exposure (RME), and reflects EPA's policy that protection of human health should be ensured. The value of three percent has been used consistently in EPA site specific dioxin risk assessments.*

2.3.90 Comment: The amount of soil that a child inadvertently ingests has also been shown to be a function of time. Basically, the more time the child spends playing in the soil, the greater the amount of soil that adheres to his or her hands and is ultimately conveyed to the child's mouth. Wilson et al. (2015) investigated this phenomenon and found that sediment ingestion rates varied from 18 mg/hr to 72 mg/hr. Based on his data, a plausible reasonable maximum value for IRSc for the hypothetical child recreator at the SJWP Site sediments would be 50 mg/hr, substantially less than the 125 mg/day value assumed in the PRG calculations that did not take time into account.

Response: *EPA developed its recommended soil ingestion rate on adjusted daily average basis and not hourly average basis to be consistent with the chronic daily average oral intake equations. These equations do not have time in hours as an input variable. In addition, EPA used the same input ingestion rate of 125 mg/day as that used by the PRP to be consistent with the HHRA developed by the PRP.*

2.3.91 Comment: The PRG that Region 6 used to calculate the PTW bright line was based on systemic non-cancer effects as expressed by a toxicological reference dose (RfD). Our sensitivity analysis of the calculations shows that the RfD is one of the most important parameters in the entire set of calculations. Contrary to EPA guidance and EPA's assertions of transparency, the uncertainties in the toxicity assessment were not presented in the Proposed Plan or underlying documentation (Khoury 2016a,b, Turner 2016a,b). Some of the items normally discussed in a toxicity assessment uncertainty analysis include qualitative toxicity, derivation of the toxicity values, study duration, extrapolations, biological mechanisms, selection of appropriate datasets, effect of different exposure routes, and potential for interactions (EPA 1989, 1992a, NRC 1994). This leaves the reader with the impression that there is absolute certainty in the RfD, which is certainly not the case. EPA's RfD for 2,3,7,8-TCDD has certainly been controversial. Although beyond the scope of these comments, detailed critiques are

available elsewhere (e.g., Magee 2010). Our comments here will be limited to those aspects of the RfD that bear on the PRG calculations and the PTW characterization.

Response: *RfD development are not within the scope of this report. Toxicity values such as RfD are developed separately from site specific risk assessments and published in central locations such as the Integrated Risk Information System (IRIS) so that consistent toxicity values are used across the regions. Values published in the IRIS go through rigorous internal and external peer review. Uncertainty factors are incorporated in its development. Accepted IRIS listed values were used in both the PRPs and EPAs risk assessments as well as the PRG derivation.*

2.3.92 Comment: Although the use of PRGs to characterize a principal threat is contrary to EPA guidance and, in this case, scientifically flawed, it is instructive to see what PRGs would look like if standard default assumptions or alternative reasonable maximum exposure concepts were used in their calculation. Since there is a poor correlation between PCDD/Fs in sediment and that in fish and since Region 6 has failed to demonstrate that a sediment→fish→human exposure pathway is complete, a standard PRG would not include this pathway but would be limited to dermal contact and inadvertent ingestion of sediment plus inhalation of particulate matter emitted by wind erosion. The ORNL/RAIS recreator receptor scenario is the basis of this PRG. This scenario assumes that a recreator contacts sediments for 75 days per year for a 1 hour event over a standard 26 year exposure period (6 years as a child and 20 years as an adult). All of the exposure factors in the ORNL/RAIS PRG model are purposefully biased to be conservative (health protective) as per EPA's reasonable maximum exposure concept (although the probability of this exposure occurring is almost infinitesimally small). The results of this calculation yield a child PRG of 240 ng/Kg, an adult PRG of 215,000 ng/Kg with a combined life-cycle PRG of 778 ng/Kg. In addition, we calculated PRGs for various default hypothetical worker receptors… These PRGs of course, only pertain to 2,3,7,8-TCDD and have bearing only on the calculation of Remedial Action Objectives and not designation of a PTW. These calculations are all based on a HI of 1. Due to uncertainties in the toxicology behind the RfD, the lack of severity of an effect, and the fact that substantial dermal absorption is not likely to occur during a 1-hour exposure period, an HI of 2 or 3 would be more appropriate and the PRGs would be adjusted upward accordingly. The resulting Remedial Action Objectives would be much higher than the maximum surface sediment 2,3,7,8-TCDD concentration of 23.9 ng/Kg found in 2016 by Integral and would likely apply only to a small portion of the northern impoundments area.

Response: *EPA utilized default exposure equations and input parameters, and where reasonable, site specific input parameters replaced default values. An appropriate site specific RME exposure input values were used in developing the PRG for the site. Input values used in the baseline human health risk assessment for the site, were also used by EPA in developing the site health based PRG value. EPA did some adjustment in input values where it was necessary to do so. Where uncertainty existed, EPA tried to err on the side of safety. Elimination of the fish consumption pathway is inconsistent with the Conceptual Site Model used by both the EPA and PRPs, consequently derivation of a PRG without this pathway is not reasonable.*

2.4 Policy Comments

EPA received over 100 comments from individuals in the surrounding communities, various regions of the United States, foreign countries, school age children, industry, industry associations, and non-governmental organizations voicing their concerns regarding EPA's implementation of the National Contingency Plan (NCP) and CERCLA as they relate to the San Jacinto River Waste Pits site.

2.4.1 Comment: A commenter questioned the EPA's use of a 7% discount rate using a 30-year timeframe. Commenter feels using a 4% discount rate with 2% inflation is more appropriate.

Response: *The net present value (NPV) analysis is a method to evaluate expenditures, either capital or O&M, which occur over different time periods. This standard methodology allows for cost comparisons of different remedial alternatives on the basis of a single cost figure for each alternative. Since the NPV analysis is being used to compare different alternatives the use of a 7% discount rate using a 30-year timeframe is appropriate. If EPA were establishing the amount of financial assurance that a PRP would need to hold, then EPA would evaluate the discount rate and timeframe. EPA utilized the policy on the use of discounted rates for Remedial Investigation/Feasibility Study costs analyses as stated in the preamble to the NCP (55 FR 8722) and in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-20 entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA 1993). Based on the NCP and this directive, a discount rate of seven percent should be used in developing present value cost estimates for remedial action alternatives during the Feasibility Study. The 7% discount rate is based on un-inflated costs. Therefore, this rate should be used with "constant" or "real" dollars that have not been adjusted for inflation (i.e., a dollar spent in future years is worth the same as a dollar spent in the present year), which is the typical situation for Remedial Investigation/Feasibility Study cost analyses.*

2.4.2 Comment: EPA also failed to explain the cost-effectiveness of its preferred dredging remedies. Among other things, CERCLA requires EPA to "select a remedial action ... that is cost effective." 42 U.S.G. § 9621(b)(1). EPA chose the most-expensive of the proposed remedies because, in EPA's view, they are superior to the alternatives. But the question is not whether alternatives 6N and 4S are better than the alternatives; the question is whether EPA can explain how those remedies are more cost-effective—that is, whether and to what extent they are so far superior to the alternatives that they warrant exponential increases in the cost of the remedial order. EPA should further consider the cost-effectiveness of the proposed remedy, and explain its choice in light of CERCLA's cost-effectiveness mandate.

Response: *During the remedy selection process, nine evaluation criteria are considered in distinct groups which play specific roles in working toward the selection of a remedy that satisfies the following five principal statutory requirements:*

1) Protect human health and the environment;
2) Comply with applicable or relevant and appropriate requirements (ARARs) unless a waiver is justified;
3) Be cost-effective;

4) Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
5) Satisfy a preference for treatment as a principal element, or provide an explanation in the Record of Decision (ROD) why the preference was not met.

The nine evaluation criteria include two "threshold" criteria, five "balancing" criteria (including cost), and two "modifying" criteria (state and community acceptance). The alternatives are also separately evaluated against a subset of the criteria to make the determination of which option(s) satisfy the statutory cost-effectiveness. A remedial alternative is cost-effective if its "costs are proportional to its overall effectiveness" (40 CFR 300.430(f)(1)(ii)(D)). Overall effectiveness of a remedial alternative is determined by evaluating the following three of the five balancing criteria: long-term effectiveness and permanence; reduction in toxicity, mobility and volume (TMV) through treatment; and short-term effectiveness. Overall effectiveness is then compared to cost to determine whether the remedy is cost-effective. As discussed below, EPA did not merely "chose the most-expensive of the proposed remedies".

When developing the costs of the alternatives presented in the Proposed Plan, EPA utilized the policy on the use of discounted rates for Remedial Investigation/Feasibility Study costs analyses as stated in the preamble to the NCP (55 FR 8722) and in Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-20 entitled "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis" (USEPA 1993). Based on the NCP and this directive, a discount rate of seven percent was used in developing present value cost estimates for remedial action alternatives during the Feasibility Study. The 7% discount rate is based on un-inflated costs. Therefore, this rate should be used with "constant" or "real" dollars that have not been adjusted for inflation (i.e., a dollar spent in future years is worth the same as a dollar spent in the present year), which is the typical situation for Remedial Investigation/Feasibility Study cost analyses.

*To better explain the cost-effectiveness of the preferred alternative, EPA utilized the guidance document entitled "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (*EPA 540-R-00-002 OSWER 9355.0-75 July 2000*). The guidance document, which was jointly developed by EPA and USACE, provides a detailed discussion on conducting the net present value (NPV) assessment. A NPV analysis of a remedial alternative involves four basic steps:*

1. Define the period of analysis.
2. Calculate the cash outflows (payments) for each year of the project.
3. Select a discount rate to use in the present value calculation.
4. Calculate the present value.

To more appropriately evaluate the cost effectiveness of Alternatives 3aN and 6N, EPA updated the NPV analysis by adjusting the period of analysis, the cash outflows for each year of the project and the discount rate.

Alternative 3aN:

Period of Analysis and Cash Outflows: *The FS assumed only 2 years of O&M would occur in the first two years of the project. The current cap has required repeated repairs in the 6 years following completion due to cap erosion, riverbed erosion, etc. To more accurately assess the cost of Alternative 3aN, EPA used a project life of 100 years with annual O&M costs of $100,000 per year. The use of an annual operation and maintenance cost, as opposed to only the first two years as was done in the Feasibility Study, allows a more appropriate assessment of the costs associated with cap repairs in the 6 years following completion of the cap, and also includes a provision for future repairs that may be necessary following severe storm events.*

Discount Rate: *The FS cost estimate employed a 7% discount rate for future year costs applied to baseline year costs (un-escalated) in accordance with EPA policy so that the costs for various alternatives can be compared on an equitable basis. However, according to the current Office of Management and Budget (OMB) "2017 Discount Rates for OMB Circular No. A-94, Appendix C", dated December 12, 2016, the relevant discount rate is 0.7% for projects of 30 years or longer and for constant-dollar flows (inflation premium removed). The impact of using a 7% discount rate compared to a 0.7% discount rate is that future year costs have an increasingly reduced impact on total project costs so that costs in later years, and especially beyond 30 years, have essentially no material impact on total project costs.*

NPV Calculation: *Using the 100-year project life, annual O&M costs of $100,000 per year and a discount rate of 0.7%, the NPV of Alternative 3aN is $80 million.*

Alternative 6N:

Period of Analysis and Cash Outflows: *the cost estimate has been modified somewhat in response to the public comments, namely to employ the use of a cofferdam and perform the excavation in the "dry" so that no material release is expected during the removal.*

NPV Calculation: *Using the 100-year project life, additional capital cost for a coffer dam, and no O&M cost except for MNA sampling, the NPV of Alternative 6N is $105 million.*

Therefore, comparing the costs for Alternatives 3aN and 6N, Alternative 6N is approximately $25 million, or 31%, higher total cost than Alternative 3aN.

The enhanced capping of the waste may be less expensive and less disruptive to the community, but results in a lower level protection to human health and the environment for the long-term. If the cap fails or if effective maintenance is not sustained over the future centuries during which severe or extreme storm events are expected, the impact will be detrimental.

Removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap, and will eliminate the potential for future environmental and human health impacts should a release occur. The cost of a future widespread sediment cleanup, as well as health impacts, resulting from a cap failure are related to the amount of material that would be released in a future hurricane or hurricanes,

which is impossible to predict with any degree of certainty. However, the history of the need for repeated cap repairs, the exposure of waste materials, the riverbed erosion that occurred adjacent to the cap, all of which occurred during storms with much less intensity that the hurricanes to which the area is prone, do not support capping as a cost-effective remedy. The Selected Remedy, removal, is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials unlike capping, which would always be susceptible to a future release following a severe storm event, or due to a failure of maintenance over a period of centuries.

2.4.3 Comment: Harris County requests the EPA require the Potentially Responsible Parties to consider off-site impacts should a release occur during cleanup, and especially include the nearby Harris County Parks as all Harris County citizens may make use of the parks and recreational fishing in its nearby waters. This review should include determining and providing appropriate warning to the public, placing limitations on public access and use, and monitoring for contamination and possible remediation if necessary.

Response: *The concerns raised by this comment will be addressed during the planning for the remediation as well as during the actual cleanup as appropriate. Public participation has been an integral part of the cleanup process to date, and will continue to be so throughout the process. EPA continues to plan and coordinate community meetings, open houses, elected officials' briefings, media interviews, public notices, and fact sheets to inform the public and keep residents updated on all site developments that affect cleanup actions.*

2.4.4 Comment: As usual, the Fed. (any Dept., but especially the EPA) moves at glacial speed to enhance the wellbeing of the citizens of this country. The toxic dumpsites in the US were identified more than 5 years ago, and it will be several years before anything is undertaken to ameliorate the mess at the site along the San Jacinto River in Texas.

Response: *In April 2005, the Texas Parks and Wildlife Department sent a letter notifying the Texas Commission on Environmental Quality of the existence of former waste pits in a sandbar in the San Jacinto River north of I-10. The Comprehensive Environmental Response, Compensation and Liability Act process is very complex and detailed program with studies taking years to complete to reach the final remedy in the Record of Decision. The San Jacinto River Waste Pits Superfund Site is very complex due to the issues involved with its location in a river that is prone to flooding and hurricanes. According to General Accounting Office document 13-252, page 48, dated April 2013, the median amount of time from Remedial Investigation and Feasibility Study phase through Remedial Action takes 120 months to complete.*

2.4.5 Comment: A Technical Assistance Grant (TAG) was awarded in 2011 but has since expired. Given the complexity of the Waste Pits Site Superfund Site and the large volume of public interest, we ask that the EPA require the PRPs to fund a TAG for the Design and Construction Phases of the Superfund process.

Response: *Technical Assistance Grants are a government-funded grant mechanism provided to communities. The EPA will consider this request. The EPA cannot require a potentially responsible party to fund a TAG.*

2.4.6 Comment: We ask that the EPA host monthly Community Advisory Committee (CAC) meetings during construction. This would allow for CAC members to receive information, relay concerns, and ask questions in one meeting which would minimize the amount of time EPA and others have to spend time answering the same questions or sharing the same concerns. We understand that it would not be reasonable to request EPA personnel to travel to Houston each month. However, CAC meetings have proven productive in the past even when EPA personnel is present via phone conference.

Response: *The EPA will take this recommendation under consideration and continue to maintain communication channels with the community.*

2.4.7 Comment: The Coalition strongly encourages the EPA to put procedures in place to notify residents and landowners when remedial activities are taking place. During the 2011 TCRA, it was clearly visible that construction was taking place but most local residents were unaware that the Waste Pits were a toxic waste site under construction. If our residents are informed about these types of activities, they can make better informed decisions for their family and their use of the river at that time.

Response: *The EPA will take this recommendation under consideration and will continue to involve the public in the cleanup process.*

2.4.8 Comment: Nearby municipalities mix at least 20% groundwater with surface water, and according to the City of Houston Public Works, there are 1,424 private groundwater wells within a 5-mile radius of the Pits. The nearest municipal water well is 1.8 miles from the Waste Pits. The nearest private groundwater well is 0.39 miles from the Pits. To date, varying levels of dioxin and furan congeners (including 2,3,7,8-TCDD) have been found in local groundwater wells. It is known that both the northern pits and southern pits are in communication with the water table and shallow groundwater. We ask the EPA to strongly consider the following recommendation made by the National Remedy Review Board "The Board recommends that, during development of decision documents, the Region include plans for monitoring groundwater quality (including all COCs) in areas bounding waste materials (laterally and vertically) to ensure groundwater contamination does not become a concern, adjacent to the site, during remedial activities. The Board also recommends that the Region include plans for evaluating, in their groundwater monitoring plan, both dissolved phase COC concentrations and concentrations that may result from facilitated transport." (September 23, 2016 Memorandum: National Remedy Review Board Recommendations for the San Jacinto River Waste Pits Superfund Site, p. 11). (San Jacinto River Coalition)

Response: *Comment noted. Ground water monitoring at the Site will be evaluated during development of the Remedial Design. However, previous ground water sampling has not identified any dioxin migration from the Site.*

2.4.9 Comment: The Proposed Plan meets the requirements of CERCLA and the National Contingency Plan. Protection of human health and permanence of the remedy are driving considerations. "The National goal of the remedy selection process is to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste." 40 CFR 300.430 (a) (l)(i); See also 42 U.S.C. 9621. "EPA's policy on management of principal threat wastes as stated in the National Contingency Plan" (40 CFR 300.430(aXl)(ii)). That policy can be summarized as: EPA expects to use treatment to address the principal threats posed by a site, wherever practicable ...EPA expects to use engineering controls, such as containment for waste that poses a relatively low long-term threat or where treatment is impracticable" (Garland, 2015). Removal is the alternative that best satisfies the goal stated above. Furthermore, it is the option that best satisfies the 9 evaluation criteria in the National Contingency Plan (40CFR300.430(e)(9)). Alternatives involving enhancement of the current temporary cap fail. to meet the criteria of overall protection of human health and the environment, long-term effectiveness and performance, community acceptance, or reduction of toxicity, mobility, or volume.

Response: *EPA has noted the comment. Removal of the waste pits material is the selected remedy for the reasons described in the Record of Decision.*

2.4.10 Comment: Why is the Government paying for the cleanup?

Response: *EPA is not paying for the cleanup. Under the Comprehensive Environmental Response, Compensation, and Liability Act, the Environmental Protection Agency can either pay for the site cleanup or take legal action to force the parties responsible for the site contamination to clean up the site or pay back the Federal government for the cost of the cleanup. In this case, a Responsible Party has been identified and is responsible for cleanup costs and reimbursement to the Federal government for costs.*

2.4.11 Comment: Why has it taken so long to clean up the pits?

Response: *In April 2005, the Texas Parks and Wildlife Department sent a letter notifying the Texas Commission on Environmental Quality of the existence of former waste pits in a sandbar in the San Jacinto River north of I-10. The Comprehensive Environmental Response, Compensation and Liability Act process is very complex and detailed with studies taking years to complete to reach the final remedy in the Record of Decision. The San Jacinto River Waste Pits Superfund Site is very complex due to its location within the San Jacinto River. According to General Accounting Office document 13-252 page 48 dated April 2013, the median amount of time from Remedial Investigation and Feasibility Study phase through Remedial Action takes 120 months to complete. This site was placed on the National Priorities List on March 19, 2008.*

2.4.12 Comment: A commenter requested the comment period be extended to February 26, 2017.

Response: *EPA Region 6 denied this request stating; "The Environmental Protection Agency (EPA) previously extended the public comment period until January 12, 2017, so that the*

public comment period at this site will be open for a total of 105 days." In addition, the EPA indicated; "However, if, after the close of the public comment period, any party provides EPA significant information not contained elsewhere in the administrative record, which it could not have submitted during the comment period and which supports the need to significantly alter the remedial action for this site, the EPA certainly will consider this information as part of the remedy selection process, as provided in Section 300.825(c) of the National Contingency Plan."

2.4.13 Comment: Is there a plan in place to monitor the waters/area after the clean-up is completed?

Response: *Yes; a monitoring plan will be developed during the Remedial Design as appropriate.*

2.4.14 Comment: Region 6's application of the second threshold criteria (overall protectiveness) is flawed and supports Alternative 3aN rather than Alternative 6N.

Response: *EPA disagrees that Alternative 3aN is more protective that 6N. Alternative 6N results in the removal of material over the cleanup levels, while Alternative 3aN, the waste will remain in place and be susceptible to floods and hurricanes for hundreds of years with no assurance that the waste can be reliably contained. During the removal process, the application of best management practices will preclude any material releases from the Site, while there is no control under Alternative 3aN should the cap be eroded and releases occur during a flood or hurricane. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.4.15 Comment: Region 6's assessment of the long-term effectiveness and performance of the alternatives (a primary balancing criterion) is misleading.

Response: *EPA disagrees that its assessment of long-term permanence is misleading. Alternative 6N results in the removal of material over the cleanup levels, while for Alternative 3aN, the waste will be left in place and susceptible to floods and hurricanes for hundreds of years. The location of the Site in the San Jacinto River and the high degree of uncertainty with model predictions for hundreds of years into the future result in little assurance that the waste can be reliably contained. During the removal process, application of best management practices will preclude any material releases from the Site, while there is no control under Alternative 3aN should the cap be eroded and releases occur during a flood or hurricane. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event*

modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.4.16 Comment: By Region 6 selecting Alternative 6N, EPA ignores Alternative 3aN will best satisfy the National Contingency Plan.

Response: *The EPA has selected Alternative 6N using the nine CERCLA remedy selection criteria. For Alternative 3aN, the waste will remain in place and be susceptible to floods and hurricanes for hundreds of years with no assurance that the waste can be reliably contained. During the removal process, application of best management practices will preclude any material releases from the Site, while there is no control under Alternative 3aN should the cap be eroded and releases occur during a flood or hurricane. Alternative 3aN does not meet the primary balancing criteria of long-term effectiveness and permanence.*

2.4.17 Comment: If Region 6 does not select Alternative 3aN, it should defer from selecting a remedy until a cost estimate and a transparent evaluation is performed that meets the requirements of the NCP.

Response: *EPA is following the procedures outlined in the NCP, and the selection rational is documented in the Record of Decision. The EPA does not agree that the remedy selection, and Site cleanup, should be delayed for further study. One of the most important factors, that of the actual frequency and intensity of future storms and hurricanes, is not knowable to any greater extent than is already available. Furthermore, delaying the cleanup for additional study will only increase the time until the protectiveness of the final remedy can be achieved. Finally, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.4.18 Comment: Did USEPA fully evaluate the US Army Corps of Engineers report before they selected and documented the proposed plan? Or was the proposed plan written prior to receiving the US Army Corps of Engineers report?

Response: *EPA reviewed the associated draft and final documents issued by the US Army Corps of Engineers prior to issuance of the Proposed Plan.*

2.4.19 Comment: Does USEPA believe in-place containment remedies in other waterways throughout the US are not protective of human health and environment and inconsistent with the National Contingency Plan?

Response: *Each waterway has its own design limitations based on weather conditions, surrounding environment and population, and the nature of the waterway in which the waste material is located. A remedy that works at one location does not guarantee it will work at all locations.*

2.4.20 Comment: Why did USEPA not formally consult with the Contaminated Sediment Technical Advisory Group (CSTAG), comprised of sediment remediation experts throughout the Agency, as expected for projects that are likely to cost more than 100 million dollars? Did CSTAG's recent opinion that a confined disposal remedy was appropriate for the Portland Harbor site cause USEPA to avoid seeking help from CSTAG?

Response: *The Site is not a large sediment site that triggers a formal review by CSTAG, instead it is a source area that is being remediated so that it does not become a large sediment site. However, the Site has been discussed with members of CSTAG in developing the remedial approach.*

2.4.21 Comment: Did USEPA feel any pressure or considered it advantageous to push this proposed plan within a few weeks of receiving US Army Corps of Engineers report to ensure USEPA's presumptive remedy would be adopted before the next Administration?

Response: *EPA released the Proposed Plan when it was ready to do so, and as early as possible due to the many concerns expressed by the community regarding the Site, including questions regarding why it was taking so long to complete the Proposed Plan. Although the Corps report was formally released shortly before the release of the Proposed Plan, the EPA was aware of its contents and had reviewed a draft and discussed the findings with the Corps of Engineers earlier than the formal release of the final report. The EPA is not aware that the incoming Administration had any impact on the release date.*

2.4.22 Comment: If EPA, for example, directs the PRPs to use berms, then sheet pile walls, then caissons when previous efforts do not work, what releases to the river during these attempts will occur? How will cost be impacted in order to have the mandatory understanding of the proportionality of cost to environmental benefit? EPA should not just hand wave, ignoring the regulatory requirements for a detailed evaluation of remedial alternatives under the National Contingency Plan, and say that these significant issues will be addressed at the Remedial Design stage.

Response: *The disturbance of waste materials during removal is unavoidable based on excavation as the selected remedial action. Minimization of sediment release will be addressed through Best Management Practices during excavation activities, including the use of cofferdams and excavation in the "dry". Removal of the source waste will eliminate the potential for a release to the environment, which is a long-term benefit that outweighs the cost of removal. As stated in the Proposed Plan, dioxin in the environment is very persistent in the environment,*

and is expected to remain toxic for a long time. Therefore, any cleanup approach involving containment would have to reliably achieve containment for a long time. The regulatory requirements are not being ignored now, nor will they be ignored in the future. The Record of Decision for the site documents, in the sections entitled "Description of Alternatives" and "Summary of Comparative Analysis of Alternatives" each alternative and describes the detailed evaluation of remedial alternatives and justification for the selected remedy.

2.4.23 Comment: The Final Interim Feasibility Study and Proposed Plan reflect a clear bias in Region 6 against containment as an effective remedy approach. Alternative 3aN was not selected as the preferred alternative based on EPA concerns over an ultra-extreme flow condition, based on a 500-year reliability benchmark. The use of a 500-year event is extreme and is inconsistent with EPA technical guidance for capping.

Response: *Due to the persistence of the contaminants of concern at the site, a conservative approach for modeling was used to best protect human health and the environment. The EPA does not agree that an ultra-extreme flow condition was used to evaluate the various alternatives. The evaluation was based on Hurricane Ike combined with the 1994 flood. These storms were selected because data was available, both had resulted in extensive damage, and using actual storm data would improve the validity of the simulation results. However, this combined storm resulted in a river flow at the Site of 390,000 cubic feet per second as reported by the US Army Corps of Engineers, but this flow was only marginally larger than the flood in 1994 alone, which was 360,000 cubic feet per second. In fact, two other floods in the 20th Century had higher flood levels than the 1994 flood based on the river gauge at Sheldon, Texas (in 1929 and in 1940). So, the simulated storm was hardly an ultra-extreme storm, although it did represent a flood that was in the range of a 100-year flood. Much of the simulated damage to the current cap with enhancements (Alternative 3N) resulted from hurricane driven waves. A category 4 or 5 hurricane would have greater wind and more intense wind driven waves, but actual storm data for these more intense hurricanes was not available and an attempt to mathematically create such a storm would inject another level of uncertainty in the simulated results.*

The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

Regarding the conditions for evaluating the protectiveness of capping, guidance typically considers the occurrence of a 100-year flood. However, the objective for the San Jacinto site, as well as any Superfund site, is to evaluate the remedy's effectiveness under the conditions that may reasonable be expected to occur at the site, and not some arbitrary standard. The EPA notes that the recent flooding from Hurricane Harvey resulted in a 500-year flood in the San Jacinto

River as indicated by the Harris County Flood Warning System. This flooding did not include the erosion effects of hurricane driven waves, which would be expected to increase the amount of cap damage that occurred.

2.4.24 Comment: The EPA Superfund Sediment Guidance (USEPA 2005 p. 7-3) encourages project managers to consider a range of scenarios reflecting both best case and worst case. For this Site, EPA Region 6 has focused on the ultra-worst case only, in its attempt to reduce uncertainty.

Response: *While a less intense storm could have been simulated, it would not add any useful information regarding protectiveness and the question of whether a cap could stand up to an intense storm that is likely to occur during the long time that the dioxin would remain toxic. The evaluation was based on Hurricane Ike combined with the 1994 flood. These storms were selected because data was available, both had resulted in extensive damage, and using actual storm data would improve the validity of the simulation results. However, this combined storm resulted in a river flow at the Site of 390,000 cubic feet per second as reported by the US Army Corps of Engineers, but this flow was only marginally larger than the flood in 1994 alone, which was 360,000 cubic feet per second. In fact, two other floods in the 20th Century had higher flood levels than the 1994 flood based on the river gauge at Sheldon, Texas (in 1929 and in 1940). So, the simulated storm was hardly an ultra-extreme storm, although it did represent a flood that was in the range of a 100-year flood. Much of the simulated damage to the current cap with enhancements (Alternative 3N) resulted from hurricane driven waves. A category 4 or 5 hurricane would have greater wind and more intense wind driven waves, and presumably resulted in more damage to the cap and more erosion of the waste materiel. However, actual storm data for these more intense hurricanes is not available and an attempt to mathematically create such a storm at the Site would inject another level of uncertainty in the simulated results.*

2.4.25 Comment: To the extent there are issues related to the weight of such a thick armor layer (Alternative 3aN), these issues could be addressed during remedial design considering features such as an additional rock toe berm and flattened slopes, as recommended in the Respondents' draft Feasibility Study.

Response: *Additional and larger rock, flattened slopes, and rock added at the toe were all included with the enhancements to the current cap considered as part of Alternative 3N model study. However, the model results still found that 80% of the cap would be significantly eroded with the simulated storm. Furthermore, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.4.26 Comment: A casual reading of the Final Interim Feasibility Study and Proposed Plan can be confusing, in that it is not clearly stated what alternative or cap design was modeled and found to have an 80% erosion under the hypothetical ultra-extreme event.

Response: *There were a number of differing conditions, both for the cap configuration and the storm simulated, so it is understandable that there could be some confusion regarding the modeling effort. The 80 percent erosion rate was calculated while modeling a "hypothetical synoptic occurrence of Hurricane Ike and the October 1994 flood applied to the temporary cap with the Alternative 3N upgrades. The modeling results are clarified in the Record of Decision.*

2.4.27 Comment: The Proposed Plan is premised on a Principal Threat Waste determination that is unnecessary, flawed, and ignores Site-specific data demonstrating that the wastes are reliably contained. The EPA's Principal Threat Waste Guidance clearly emphasizes the primacy of the National Contingency Plan remedy selection framework and its evaluation of remedial alternatives using the nine criteria in 40 CFR § 350.430(f)(1). A Principal Threat Waste determination is intended to streamline the identification of source material to be treated to reduce toxicity, mobility, or volume (TMV), if practicable. In this case, Region 6 has misused the Principal Threat Waste Guidance to select a remedy (and, indeed, to override the applicable selection criteria), not to identify wastes that should be treated. In fact, Region 6's preferred remedy does not provide for treatment to reduce TMV; rather, the preferred remedy simply removes the waste from one location and transports it to another.

Response: *The Proposed Plan states that the "waste material is highly toxic and may be highly mobile in a severe storm and therefore is considered a Principal Threat Waste. The Environmental Protection Agency considers material at the Site with more than 300 ng/kg dioxin to be Principal Threat Waste. This concentration was calculated by multiplying the sediment Preliminary Remediation Goal of 30 ng/kg by a factor of 10. Dioxin has been detected at the site in concentrations as high as 43,000 ng/kg in the waste pits and 50,000 ng/kg in the Southern Impoundment. EPA disagrees that the waste is reliably contained for the long term. Repeated instances of repair and maintenance occurred from July 2012 to June 2016. All of the above cases of eroded or missing armor stone occurred with flooding less than less that the design 100-year storm. The EPA applied the CERCLA remedy criteria for selection of the removal alternative in determining that the containment of the waste could not be reliably done over the long term.*

2.4.28 Comment: Alternative 6N does not include a supportable cost estimate that complies with the requirements of CERCLA and the NCP for its new "removal in the dry" alternative. Failure to address this means that selection of Alternative 6N based on the Final Interim Feasibility Study and the current Administrative Record would be arbitrary and capricious.

Response: *The Record of Decision includes revised cost estimates to incorporate the use of cofferdams, removal in the "dry", additional de-watering, changing the remediation goal for the waste pits to 30 ng/kg from 200 ng/kg, as well as other components that were incorporated in response to consideration of the public comments. However, the costs are still within the + 50 % to minus 30% range expected for feasibility study estimates, and are not inappropriate. These changes are discussed in the Record of Decision.*

2.4.29 Comment: EPA Region 6's evaluation of remedial alternatives under CERCLA and the NCP is fatally flawed. The Proposed Plan rejects the demonstrably more effective remedy (Alternative 3aN) in favor of a remedy that will cause significant releases of dioxin to the San Jacinto River. In doing so, EPA Region 6 performs a flawed and arbitrary evaluation of the alternatives under CERCLA and the NCP's nine criteria test. EPA Region 6 states that both Alternative 3aN and Alternative 6N meet the threshold criteria of protection of human health and the environment and compliance with all applicable or relevant and appropriate requirements (ARARs). However, these determinations are questionable with regard to Alternative 6N because Region 6 does not clearly define how Alternative 6N will be implemented or how it will comply with applicable ARARs, given that its implementation will result in significant releases to the San Jacinto River. Region 6 has inappropriately and without a credible basis dismissed these concerns as to whether Alternative 6N meets the threshold criteria. These are not concerns that, as Region 6 suggests, can be addressed in the design phase.

Response: *The EPA evaluated the remedial alternatives in accordance with the nine CERCLA remedy selection criteria as documented in the Record of Decision. Alternative 6N will be implemented using best management practices, including cofferdams and excavation in the "dry", and will comply with the Site ARARs as described in the Record of Decision. The removal with best management practices will minimize and control releases to the San Jacinto River, and will prevent the potential for much greater releases to the San Jacinto River as a result of a severe storm damage to a cap. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.4.30 Comment: For the balancing criteria addressing treatment to reduce toxicity, mobility, or volume (TMV), Region 6 clearly misapplies the criterion because Alternative 6N involves no treatment to reduce TMV, yet Region 6 ranks Alternative 6N as higher than Alternative 3aN on this criterion. Region 6 rates Alternative 6N higher than Alternative 3aN on long-term effectiveness and permanence by downplaying the releases that the US Army Corps of Engineers predicts will occur as a result of Alternative 6N and by disregarding the US Army Corps of Engineers conclusions regarding capping and the long-term record of performance of such remedies.

Response: *The mobility and volume of waste within the San Jacinto River will be greatly reduced by the removal of the waste material. Alternative 6N is the selected remedial action following a consideration of the nine CERCLA remedy selection criteria as discussed in the Record of Decision, including its improved long term effectiveness compared to containment in the San Jacinto River, which is subject to potential releases as a result of the impact of hurricanes, among other things. The Corps of Engineers performed a more recent model*

simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.4.31 Comment: The Proposed Plan is not based on a cost estimate that satisfies the National Contingency Plan's requirements. It also does not include a discussion of cost-effectiveness although it is a criterion that must be evaluated under CERCLA. Even in the absence of an appropriate cost estimate, Alternative 6N will be significantly more expensive to implement than Alternative 3aN. Alternative 6N also results in significantly more releases of dioxin to the environment and a much greater environmental footprint than Alternative 3aN. Alternative 3aN is clearly the more cost-effective remedy, and the Proposed Plan is flawed for not even including an evaluation of this CERCLA-required criterion.

Response: *The enhanced capping of the waste may be less expensive and less disruptive to the community, but results in a lower level protection to human health and the environment for the long-term. If the cap fails or if effective maintenance is not sustained over the future centuries during which many severe or extreme storm events are expected, the impact will be detrimental.*

As discussed in the Record of Decision, the cost effectiveness of the selected remedial action is dependent on its costs as well as its effectiveness in protecting human health and the environment. First, focusing on the northern waste pits and starting with costs, the estimated cost for the selected remedy in the Proposed Plan, Alternative 6N, is $87 million compared to $24.8 million for the capping Alternative 3aN, for example. These cost estimates employ a 7% discount rate for future year costs applied to baseline year costs (un-escalated) in accordance with EPA policy so that the costs for various alternatives can be compared on an equitable basis. However, according to the current Office of Management and Budget (OMB) "2017 Discount Rates for OMB Circular No. A-94, Appendix C", dated December 12, 2016, the relevant discount rate is 0.7% for projects of 30 years or longer and for constant-dollar flows (inflation premium removed). The impact of using a 7% discount rate compared to a 0.7% discount rate is that future year costs have an increasingly reduced impact on total project costs so that costs in later years, and especially beyond 30 years, have essentially no impact on total project costs. For the San Jacinto River Waste Pits Site, the more appropriate discount rate to use for evaluating cost effectiveness is the current OMB discount rate of 0.7% because it more accurately incorporates future costs than does the 7% discount rate. Therefore, the total cost of Alternative 3aN is $80 million using a 100-year project life, $100,000/year annual operation and maintenance costs, and a 0.7% discount rate. The use of an annual operation and maintenance cost, as opposed to only the first two years as was done in the Feasibility Study, allows a more appropriate assessment of the costs associated with cap repairs, exposed waste, and repairs of riverbed erosion as has been experienced in the 6 years following completion of the cap, and

also includes a provision for future repairs that may be necessary following hurricanes, which fortunately have not occurred since the cap completion.

Next, moving to Alternative 6N, the selected remedial action, the cost estimate has been modified somewhat in response to the public comments, namely to employ the use of a cofferdam and perform the excavation in the "dry" so that no material release is expected during the removal. The new cost estimate for Alternative 6N is $105 million as detailed in the Record of Decision. Therefore, comparing the costs for Alternatives 3aN and 6N, Alternative 6N is approximately $25 million, or 31%, higher total cost than Alternative 3aN.

Regarding cost-effectiveness, removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap, and will eliminate the potential for future environmental and human health impacts should a release occur. The cost of a future widespread sediment cleanup, as well as health impacts, resulting from a cap failure are related to the amount of material that would be released in a future hurricane or hurricanes, which is impossible to predict with any degree of certainty. However, the history of the need for repeated cap repairs, the exposure of waste materials, the riverbed erosion that occurred adjacent to the cap, all of which occurred during storms with much less intensity that the hurricanes to which the area is prone, do not support capping as a cost-effective remedy. The Selected Remedy, removal, is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials unlike capping, which would always be susceptible to a future release following a severe storm event, or due to a failure of maintenance over a period of centuries.

2.4.32 Comment: The Proposed Plan contravenes CERCLA's requirement that any removal action, to the greatest extent practicable, contributes to the efficient performance of any long-term remedial action. As part of a Time Critical Removal Action (TCRA), Respondents, under an agreed order on consent with EPA Region 6, constructed and later enhanced the armored cap. The Action Memorandum for the TCRA, as required by §104(a)(2) of CERCLA, requires that the TCRA be consistent with the long-term remedy at the Site. Alternative 3aN is consistent with the TCRA. In contrast, Alternative 6N deconstructs and removes the existing cap, which renders Alternative 6N far more complicated and in fact will result in releases; Alternative 6N thus is not "consistent with" the TCRA. Alternative 6N does not comply with CERCLA §104(a)(2).

Response: *The temporary cap was necessary to prevent continuing releases of dioxin to the San Jacinto River, as well as to prevent the direct exposure of trespassers. It was anticipated that the Site would require a significant amount to time to complete the necessary Site investigations and assessments, so the temporary cap could not be reasonably delayed. Now, the investigations are complete, addition data and analysis are available that were not available at the time of the cap construction, and a final remedy has been selected based on the nine CERCLA remedy selection criteria. These criteria resulted in the selection of removal of the dioxin waste as the final remedy because, among other things, the capping remedy could not be shown to reliably contain the waste under the conditions of the San Jacinto River with the*

potential occurrence of severe storms and hurricanes. Regardless of the "consistent with" issue, it would not be reasonable to select a containment remedy when that remedy could not be shown to be reliably protective in the long term.

Regarding implementation of the selected remedy, construction activities on saturated sediments is commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River Waste Pits. The armored cap above a small section of the Site would be removed first and then entire depth of waste material n that small section would be removed next. The excavation would then proceed in an adjacent section using the same approach. The size of the section would be dependent on the reach of the equipment and the slumping of the waste materials. Swamp mats can improve equipment mobility and increase efficiency. A sump would be excavated along the edge below the depth of contamination to collect runoff, seepage and drainage, and improve dewatering. The sump would be pumped down as needed to maintain a dewatered site. Performing the construction behind a cofferdam and sheetpile walls in a dewatered state will preclude any material releases from the Site.

2.4.33 Comment: EPA Region 6 does not appear to have meaningfully involved the State of Texas in the selection of the proposed remedy. Under Section 121(f)(1) of CERCLA, EPA is required to provide substantial and meaningful involvement by the State in the selection of remedial actions. The State played a central role in the listing of the Site; it was involved in earlier stages of the Remedial Investigation process and the initial development of remedial alternatives for the Site. Once Region 6 apparently settled on removal as its preferred remedy, however, the State's involvement appears to have been limited. The NCP requires that a proposed remedial action plan state either that (1) the EPA and the State have reached agreement on the preferred remedy, or (2) the EPA and the State have not reached an agreement and set out the State's concerns. This required statement is glaringly missing in the Proposed Plan, which instead simply states that the Texas Commission on Environmental Quality (TCEQ) "has been informed about the Preferred Remedy for the Site."

Response: *The Texas Commission on Environmental Quality has been and will continue to be involved in the selection of remedy for the Site. The Environmental Protection Agency Region 6 office is the lead agency for this Site. The Texas Commission on Environmental Quality is the support agency. As the support agency, the State reviews and comments on the remedial investigation and feasibility study, the Proposed Plan, the Record of Decision, and the remedial design. As part of the Public Comment Period, the state's position and key concerns related to the preferred alternative and other alternatives were assessed prior to the Environmental Protection Agency making a final remedy selection.*

2.4.34 Comment: The Proposed Plan is inconsistent with EPA's "Greener Cleanup Activities" policy. Under EPA's August 2, 2016, memorandum regarding "Consideration of Greener Cleanup Activities in the Superfund Cleanup Process," and associated agency policies (Greener Cleanup Policy), EPA encourages the Regions to conduct an environmental "footprint" analysis of remedial alternatives to help evaluate and quantify the environmental impact of the remedial alternatives using five core elements. A "footprint" analysis of the remedial alternatives for the

Northern Impoundment does not appear to have been included in the Administrative Record. Had such an analysis been completed, however, it is clear that it would have shown that Alternative 6N will create a much larger environmental footprint than Alternative 3aN, and compares unfavorably to Alternative 3aN on all five core elements of the Greener Cleanup Policy. In the Final Interim Feasibility Study, Region 6 admits that Alternative 6N is a "less sustainable" alternative "considering potential ozone precursor, [particulate matter] and greenhouse gas emissions from the construction activity."

Response: *As stated in the referenced memorandum, consideration of greener cleanup activities should be carried out in a manner consistent with CERCLA, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and EPA guidance. This memorandum supplements the Agency's fact sheets and policy statements addressing greener cleanup activities, tools and considerations; however, it neither amends nor modifies the NCP in any way (*e.g., *consideration of greener cleanup activities should not be treated as a new criterion under 40 CFR Section 300.430(e)(9)(iii). EPA utilized existing criteria in selection of the Preferred Alternative as required by the NCP.*

The environmental footprint of Alternative 6N, with the use of a cofferdam and excavation in the "dry", is much less the that of Alternative 3aN with its potential for a future long-term release of dioxins. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.4.35 Comment: Full removal could result in violations of state law that are not shielded by CERCLA. As the US Army Corps of Engineers Report makes clear, the existing armored cap cannot be removed and the underlying waste excavated without releases of dioxins to the environment. Consequently, if Respondents (and their contractors) were to implement the proposed remedy, they would be subject to potential civil enforcement actions under the Texas Water Code and state water quality standards. It is highly questionable whether Region 6 has the authority under CERCLA to order Respondents to implement Alternative 6N under these circumstances. Moreover, such an action by EPA Region 6 would violate Respondents' due process rights. The current Administrative Record fully supports selection of Alternative 3aN as the preferred alternative. The Proposed Plan should be rejected and EPA Region 6 should instead select Alternative 3aN. In fact, given the shortcomings in the remedy selection process identified above, selecting Alternative 6N would be arbitrary, capricious, and not supported by the Administrative Record. Respondents strongly believe that an unbiased remedy selection assessment, based on a complete Administrative Record, supports the selection of Alternative 3aN as the preferred remedy for the Site.

Response: *The implementation of best management practices will prevent any material releases and prevent a potential much larger release associated with a failure of a containment cap over the long-term. The use of a cofferdam and excavation in the "dry", as well as only removing small parts of the armor cap at any one time prior to waste removal, will prevent the releases typically associated with dredging projects. EPA disagrees with the statement that the Administrative Record supports the selection of Alternative 3aN. In fact, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.4.36 Comment: Armored caps are being utilized nationally and have a strong record of performance. Table 4-1a of the Final Interim Feasibility Study includes an example list of sites around the country where caps are being utilized and where conditions are similar to the Site. The report evaluating the remedial alternatives prepared by the US Army Corps of Engineers for Region 6 (US Army Corps of Engineers Report) concluded that no armored cap has "failed" to date. Region 6 acknowledges this fact in the Proposed Plan. Despite these facts, Region 6 questions the long-term effectiveness of a cap, applying a 100% certainty standard of effectiveness to Alternative 3aN over a 500-year period. The standard of certainty applied to the capping remedy by Region 6 is inconsistent with the NCP and national remedy evaluation precedent, as well as being internally inconsistent.

Response: *The Proposed Plan states that there appears to be no documented cases of any armored cap or armored confined disposal facility breaches, while the Final Interim Feasibility Study states that after an extensive literature review, there appear to be no documented cases of any armored cap or armored confined disposal facility. However, both documents go on to additionally state that there have been many occurrences of breaches and slope failures of armored dikes, jetties, and breakwaters, with some of those structures confining dredged material. Table 10-1 within Appendix A of the Final Interim Feasibility Study lists 10 examples of locations where armor breaches and failures have occurred. In conjunction with the persistent nature of the site contaminants, it is due to these types of failures over relatively short time periods that EPA has selected the removal alternatives. The list of failures is also why EPA questions the long-term effectiveness of the current cap, which itself has undergone a series of repeated damage events and repairs since it's installation in 2011.*

The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the

potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

Regarding certainty, EPA does not have a requirement for a "100% certainty" to evaluate capping effectiveness; instead capping, or any remedial action, must provide long-term protectiveness. However, the current cap's history, the future exposure to repeated hurricanes, and the U.S. Corps of Engineers model results for an upgraded cap do not demonstrate that capping could provide acceptable long-term protectiveness.

2.4.37 Comment: The Proposed Plan fails to provide an appropriate evaluation of the remedial alternatives particularly the comparison of Alternatives 3aN and 6N, which is contrary to CERCLA and the National Contingency Plan ("NCP") (40 CFR Part 300).

Response: *A detailed evaluation of the remedial alternatives is presented in the Final Interim Feasibility Study Report and in the Record of Decision.*

2.4.38 Comment: The Proposed Plan does not comport with the Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (U.S. EPA 2002a) nor U.S. EPA's Contaminated Sediment Guidance (2005).

Response: *The EPA disagrees with the assertion that the Proposed Plan is not in conformity with the Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites principles or the EPA's Contaminated Sediment Guidance. The management of the Site, the Proposed Plan, and the Record of Decision addressed the principles covered in the 2002 memo, including the principle of achieving long term protectiveness. Based on historical performance of the temporary cap and surrounding area, there is a concern regarding the sediment erosion adjacent to the capped area and potential release and transport of the dioxin which would further impact ecological and human receptors. The long-term performance of the cap is questionable. There have been multiple repairs required to maintain the isolation barrier for the contaminated sediment. Furthermore, the Proposed Plan is consistent with Section 2.7 of the Contaminated Sediment Guidance which addresses phased approaches, adaptive management, and early actions. As a result, it is EPA's contention that fully supportable risk-based decisions based on EPA guidance are incorporated into the selected remedy.*

2.4.39 Comment: The U.S. EPA Region 6 has not applied the NCP's cost effectiveness criterion correctly in its Proposed Plan. In particular, U.S. EPA Region 6 has proposed a remedy, Alternative 6N, that will cost substantially more than an alternative remedy (Alternative 3aN) but will not provide any meaningfully greater risk reduction. In fact, the implementation of the Proposed Plan would have the unenviable distinction of resulting in significant incremental cost to achieve significantly less incremental protectiveness, in violation of the NCP's cost-effectiveness requirement. Accordingly, U.S. EPA Region 6 has failed to demonstrate that the Proposed Plan's remedy is cost-effective when compared to Alternative 3aN.

Response: *The enhanced capping of the waste may be less expensive and less disruptive to the community, but results in a lower level protection to human health and the environment for the long-term. If the cap fails or if effective maintenance is not sustained over the future*

centuries during which many severe or extreme storm events are expected, the impact will be detrimental.

As discussed in the Record of Decision, the cost effectiveness of the selected remedial action is dependent on its costs as well as its effectiveness in protecting human health and the environment. First, focusing on the northern waste pits and starting with costs, the estimated cost for the selected remedy in the Proposed Plan, Alternative 6N, is $87 million compared to $24.8 million for the capping Alternative 3aN, for example. These cost estimates employ a 7% discount rate for future year costs applied to baseline year costs (un-escalated) in accordance with EPA policy so that the costs for various alternatives can be compared on an equitable basis. However, according to the current Office of Management and Budget (OMB) "2017 Discount Rates for OMB Circular No. A-94, Appendix C", dated December 12, 2016, the relevant discount rate is 0.7% for projects of 30 years or longer and for constant-dollar flows (inflation premium removed). The impact of using a 7% discount rate compared to a 0.7% discount rate is that future year costs have an increasingly reduced impact on total project costs so that costs in later years, and especially beyond 30 years, have essentially no impact on total project costs. For the San Jacinto River Waste Pits Site, the more appropriate discount rate to use for evaluating cost effectiveness is the current OMB discount rate of 0.7% because it more accurately incorporates future costs than does the 7% discount rate. Therefore, the total cost of Alternative 3aN is $80 million using a 100-year project life, $100,000/year annual operation and maintenance costs, and a 0.7% discount rate. The use of an annual operation and maintenance cost, as opposed to only the first two years as was done in the Feasibility Study, allows a more appropriate assessment of the costs associated with cap repairs, exposed waste, and repairs of riverbed erosion as has been experienced in the 6 years following completion of the cap, and also includes a provision for future repairs that may be necessary following hurricanes, which fortunately have not occurred since the cap completion.

Next, moving to Alternative 6N, the selected remedial action, the cost estimate has been modified somewhat in response to the public comments, namely to employ the use of a cofferdam and perform the excavation in the "dry" so that no material release is expected during the removal. The new cost estimate for Alternative 6N is $105 million as detailed in the Record of Decision. Therefore, comparing the costs for Alternatives 3aN and 6N, Alternative 6N is approximately $25 million, or 31%, higher total cost than Alternative 3aN.

Regarding cost-effectiveness, removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap, and will eliminate the potential for future environmental and human health impacts should a release occur. The cost of a future widespread sediment cleanup, as well as health impacts, resulting from a cap failure are related to the amount of material that would be released in a future hurricane or hurricanes, which is impossible to predict with any degree of certainty. However, the history of the need for repeated cap repairs, the exposure of waste materials, the riverbed erosion that occurred adjacent to the cap, all of which occurred during storms with much less intensity that the hurricanes to which the area is prone, do not support capping as a cost-effective remedy. The Selected Remedy, removal, is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time

frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials unlike capping, which would always be susceptible to a future release following a severe storm event, or due to a failure of maintenance over a period of centuries.

2.4.40 Comment: In its Guidance on National Consistency in Superfund Remedy Selection (U.S. EPA 1996), U.S. EPA emphasized the critical importance of maintaining appropriate national consistency in the remedy selection process. In this context, appropriate consistency means applying decision-making processes recommended in national policies and guidance using the criteria, they lay out, and exercising the built-in flexibility as appropriate to address site specific circumstances. Several aspects of the Proposed Plan fail to comply with EPA Superfund Remediation Policy, as embodied in CERCLA, the NCP and the Contaminated Sediment Guidance. These include its unprecedented requirement to remove the existing TCRA cap, the virtual 100% certainty applied to evaluation of potential capping effectiveness, the misapplication of the Principal Threat Waste Guidance, the failure to evaluate and apply extensive data required to be collected by EPA that confirms the existing cap's effectiveness, and the failure to comply with the NCP's proportionality test for cost-effectiveness evaluation.

Response: *The process used to prepare the Proposed Plan and the Record of Decision are consistent with appropriate regulation and guidance. The early action in the San Jacinto River involved placement of a cap over a hot spot in the river, which is in conformity with the number one principle (i.e., "Control Sources Early") contained in EPA's guidance for managing contaminated sediment sites. Over the course of multiple years, the integrity of the cap, the stability of the river bed, and the potential release of the contamination raised substantial questions regarding the long-term performance of the remedy. There have been repeated repairs required for the cap and in certain instances, the underlying contaminated sediment was completely exposed to the aquatic environment. The environmental conditions are having a significant impact on the cap integrity. The selected remedy for removal is in conformity with another principle (i.e., "Achieving Long-Term Protection") contained in EPA's guidance for managing contaminated sediment sites.*

Regarding certainty, EPA does not have a requirement for a "virtual 100% certainty" to evaluate capping effectiveness; instead capping, or any remedial action, must provide long-term protectiveness. However, the current cap's history, the future exposure to repeated hurricanes, and the U.S. Corps of Engineers model results for an upgraded cap do not demonstrate that capping could provide acceptable long-term protectiveness.

2.4.41 Comment: U.S. EPA Region 6 failed to conduct an adequate cost-effectiveness evaluation. The Proposed Plan is not cost-effective as required by CERCLA, the NCP and the Sediment Guidance. CERCLA requires that any remedial action that is selected must be "cost effective." 42 USC 9621(a). The NCP states, "[e]ach remedial action selected shall be cost effective, provided that it first satisfies the threshold criteria set forth in § 300.430(f)(1)(ii)(A) and (B). Cost-effectiveness is defined as when "costs are proportional to [the remedial alternative's] overall effectiveness." 40 CFR §300.430(f)(1)(ii)(D). As U.S. EPA stated in its Superfund Guidance, "cost-effectiveness is concerned with the reasonableness of the relationship

between the effectiveness afforded by each alternative and its costs compared to other available options." U.S. EPA 1999. Moreover, "if the difference in effectiveness is small but the difference in cost is very large, a proportional relationship between the alternatives does not exist." U.S. EPA 1990, Preamble to NCP. These proportionality requirements were reiterated by U.S. EPA in the Sediment Guidance. Regions must select remedies that are cost effective (p. 7-17) and should "compare and contrast the cost and benefits of various remedies." (p. 7-1). EPA has estimated the cost of the Proposed Plan to be $87 million. However, Alternative 3aN is expected to cost $24.8 million. The technical reports at the Site confirm that Alternative 3aN is likely to be as protective, and in all likelihood, more protective of human health and the environment than the Proposed Plan, which would result in substantial risks due to the inevitable resuspension and release during the unprecedented removal of the existing armored cap, as discussed above. Consequently, the incremental (and total) cost of the Proposed Plan is not only disproportionate to the risk reduction, it appears to be inversely proportional (causing more risk rather than risk reduction) for more cost, and, therefore, the Proposed Plan fails to meet the cost-effectiveness requirement of CERCLA and NCP Section 40 CFR §300.430(f)(1)(ii)(D).

Response: *The enhanced capping of the waste may be less expensive and less disruptive to the community, but results in a lower level protection to human health and the environment for the long-term. If the cap fails or if effective maintenance is not sustained over the future centuries during which many severe or extreme storm events are expected, the impact will be detrimental.*

As discussed in the Record of Decision, the cost effectiveness of the selected remedial action is dependent on its costs as well as its effectiveness in protecting human health and the environment. First, focusing on the northern waste pits and starting with costs, the estimated cost for the selected remedy in the Proposed Plan, Alternative 6N, is $87 million compared to $24.8 million for the capping Alternative 3aN, for example. These cost estimates employ a 7% discount rate for future year costs applied to baseline year costs (un-escalated) in accordance with EPA policy so that the costs for various alternatives can be compared on an equitable basis. However, according to the current Office of Management and Budget (OMB) "2017 Discount Rates for OMB Circular No. A-94, Appendix C", dated December 12, 2016, the relevant discount rate is 0.7% for projects of 30 years or longer and for constant-dollar flows (inflation premium removed). The impact of using a 7% discount rate compared to a 0.7% discount rate is that future year costs have an increasingly reduced impact on total project costs so that costs in later years, and especially beyond 30 years, have essentially no impact on total project costs. For the San Jacinto River Waste Pits Site, the more appropriate discount rate to use for evaluating cost effectiveness is the current OMB discount rate of 0.7% because it more accurately incorporates future costs than does the 7% discount rate. Therefore, the total cost of Alternative 3aN is $80 million using a 100-year project life, $100,000/year annual operation and maintenance costs, and a 0.7% discount rate. The use of an annual operation and maintenance cost, as opposed to only the first two years as was done in the Feasibility Study, allows a more appropriate assessment of the costs associated with cap repairs, exposed waste, and repairs of riverbed erosion as has been experienced in the 6 years following completion of the cap, and also includes a provision for future repairs that may be necessary following hurricanes, which fortunately have not occurred since the cap completion.

Next, moving to Alternative 6N, the selected remedial action, the cost estimate has been modified somewhat in response to the public comments, namely to employ the use of a cofferdam and perform the excavation in the "dry" so that no material release is expected during the removal. The new cost estimate for Alternative 6N is $105 million as detailed in the Record of Decision. Therefore, comparing the costs for Alternatives 3aN and 6N, Alternative 6N is approximately $25 million, or 31%, higher total cost than Alternative 3aN.

Regarding cost-effectiveness, removal will eliminate the potential for the costs associated with cleaning up a large contaminated sediment site that may result from a failure of a cap, and will eliminate the potential for future environmental and human health impacts should a release occur. The cost of a future widespread sediment cleanup, as well as health impacts, resulting from a cap failure are related to the amount of material that would be released in a future hurricane or hurricanes, which is impossible to predict with any degree of certainty. However, the history of the need for repeated cap repairs, the exposure of waste materials, the riverbed erosion that occurred adjacent to the cap, all of which occurred during storms with much less intensity that the hurricanes to which the area is prone, do not support capping as a cost-effective remedy. The Selected Remedy, removal, is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials unlike capping, which would always be susceptible to a future release following a severe storm event, or due to a failure of maintenance over a period of centuries.

2.4.43 Comment: In developing the Proposed Plan and communicating its results, EPA Region 6 did not comply with EPA national guidelines for transparency and failed to acknowledge scientific and engineering uncertainty in its presentation of the Proposed Plan.

Response: *EPA disagrees and has been open throughout the process of development of the Proposed Plan. The issue of uncertainty has been thoroughly discussed in the record for the Site and in the Record of Decision.*

2.4.44 Comment: A containment remedy such as Alternative 3aN would meet goals for protection of human health and the environment and compliance with Applicable or Relevant and Appropriate Requirements, while being considerably more implementable, more effective in the short-term, and more cost-effective than the proposed remedy.

Response: *The factors listed by the commenter were considered in selection of the preferred remedy and are presented in the Record of Decision. However, the Environmental Protection Agency believes that the selected remedy is protective of human health and the environment, complies with applicable, relevant, and appropriate requirements, and provides the best balance of tradeoffs among the balancing criteria. It reduces risks within a reasonable time frame, provides for long-term reliability of the remedy, and minimizes reliance on institutional controls. It will achieve substantial risk reduction by removing the contaminated materials. and manages the remaining risks health through institutional controls.*

Regarding the protection of human health and the environment with Alternative 3aN, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community and eliminate the potential for a release to the environment. The selected remedy is cost effective because it will prevent the costs associated with the Site becoming a large contaminated sediment site.

Regarding the implementability of Alternative 6N, the use of a cofferdam is considered to be the most effective best management practice to control releases and residuals for complete removal of the waste material at the San Jacinto River Waste Pits. Cofferdams offer flexibility in construction methods and material to accommodate the local site conditions and project goals. Additionally, the cofferdam can be placed outside of the armored cap to prevent disturbance of the contaminated sediment prior to containment. Cofferdams have been constructed in similar locales for excavation and construction activities such as at the Formosa Plastics, Texas site for contaminated sediment removal, at Matagorda Bay for archeological recovery and at numerous coastal sites for construction. Removal in the "dry" was performed to control organic chemical liquid releases in the upper 1 ½ miles of the Housatonic River site using cofferdams and by-passing the river flows. Sheet pile wall cofferdams have been used in a large sediment removal in the "dry" project in the Grand Calumet River in Indiana to control organic chemical liquid releases. Berms have been employed to form cofferdams to control resuspension at Hooker Chemical site in New York.

2.4.45 Comment: EPA policy is that significant Superfund sediment projects require review by the EPA headquarters National Remedy Review Board (NRRB). It its review, the NRRB (2016) posed four questions to Region 6 regarding PTW and requested that the region explain fully how the site's PTW approach was consistent with CERCLA and the NCP. Three of these four questions deal with the subject of treatment:

- CERCLA § 121(b)(1) preference for treatment to the maximum extent practicable
- CERCLA § 121(d)(1) requirements regarding selection of remedies that ensure protectiveness of human health and the environment and achieve or waive applicable or relevant and appropriate requirements
- 40 CFR § 300.430(a)(1)(iii)(A) expectation that treatment be used to address the principle threats posed by a site wherever practicable
- 40 CFR § 300.430(a)(1)(ii)(E) preference for treatment to the maximum extent practicable while protecting human health and the environment, attaining ARARs, and providing the best balance of trade-offs among the NCPs five balancing criteria.

In its response to these questions, Region 6 chose not to address the questions but to make qualitative subjective statements defending their characterization of the waste as PTW. In the context of Superfund, "treatment" is defined by CERCLA § 121 as an activity that "permanently and significantly reduces the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants." Region 6's preferred remedial alternative does not involve

treatment of the putative PTW in the context of CERCLA, but merely moving it from one place to another. It will not result in a decrease in toxicity.

Response: *Treatment of sediments containing high concentrations of dioxins is challenging. Dioxins are notoriously persistent, and there are few technologies (i.e. ex situ incineration using specialized equipment) demonstrated to permanently decrease the volume, toxicity, and mobility at the same time. These technologies are very costly and involve substantial logistical concerns. As such, Alternative 6N goes furthest of any alternative evaluated to decrease mobility through removal, stabilization, and placement in a licensed, controlled facility; to limit the impacts of toxicity by reducing potential environmental exposures in the San Jacinto River bed; and to control volume by eliminating the potential for releases to other sediments in the future. As such, Alternative 6N is the most effective at achieving the goals of treatment of any of the alternatives practically available even if it does not involve treatment.*

2.4.46 Comment: EPA uses the term "catastrophic" in the Proposed Plan (page 2) to describe possible future releases. It is recommended that this term be defined.

Response: *Noted. Catastrophic refers to an event that involves or causes a sudden great damage or suffering, or a large scale alteration of the condition of something, as in a sudden erosion of the cap and the release of toxic contaminated waste from the waste pits. Catastrophic will be defined in the Record of Decision.*

2.4.47 Comment: EPA determined that the removal alternative (4S) is more protective in the long-term and permanent because the waste material could be potentially compromised by future extreme weather events. Removal of all waste would be potentially more protective in the long-term regardless of the contamination, the location, or the situation. However, that may go beyond what is actually required by regulation. Stating "because the dioxin waste in the northern impoundments and southern impoundment at the site is both highly toxic and potentially highly mobile (due to river flooding), it is considered a principal threat waste", EPA concludes that the Southern impoundment is subject to similar river flooding as the northern impoundment. It would be helpful for EPA to clarify if the different environments of these two areas both support waste removal.

Response: *The location of materials, either partially submerged within the San Jacinto River (northern impoundments) or on a small peninsula on the San Jacinto River (southern impoundment), is in a river environment that is subject to dramatic change, creating concerns about the permanence of an armored cap. The area has a high threat of repeated storm surges and flooding from hurricanes and tropical storms, which, if the material was left in place, could result in a release of hazardous substances. The history of repeated armor cap maintenance as a result of floods that are much less severe than the design 100-year flood does not support the long term effectiveness of a containment remedy. In addition, dioxin in concentrations of more than 43,000 ng/kg is present in the waste pits and more than 50,000 ng/kg is present within the southern impoundment. Dioxin is highly toxic and persistent in nature and will not breakdown for hundreds of years under the conditions at the Site. With the regular occurrence of severe storms and flooding in the area, there is uncertainty that the waste material can be reliably contained over the long-term and therefore should be considered potentially highly mobile due*

to its location in a dynamic river environment. Due to this mobility and persistence, EPA feels that both areas support waste removal.

2.5 Cap Characteristics

EPA received hundreds of comments from individuals, industry, industry associations, non-governmental organizations, professional organizations, and regulatory agencies voicing their concern that USEPA has not fully evaluated the ability to remove the exiting cap and that an improved cap is the most reliable method for long-tern containment of the waste.

2.5.1 Comment: The US Army Corps of Engineers found that capping would be permanent and effective at containing pollutants at the northern disposal site. EPA rejected the USAGE conclusions because it is possible that (a) the cap could be damaged by a barge strike, (b) the cap could be damaged by "extreme weather events," and (c) climate change and sea-level rise is likely to make future weather events even more severe and frequent. As to EPA's first reason, the US Army Corps of Engineers found that "[a] major barge strike, which would be predicted to occur once in 400 years, would impact less than 1% of the cap area and potentially release less than 0.1% of the contaminated sediment, which is less than 25% of the releases predicted for [EPA's preferred removal remedy]." (Feasibility Study App. A at 3.) And the US Army Corps of Engineers noted that the risks of a barge strike could be all but eliminated by reinforcing and protecting the cap. See id. at 60-69. EPA did not provide a reasoned basis for rejecting the US Army Corps of Engineers findings, given that (1) major barge strikes happen once every 400 years, (2) even a major barge strike would affect less than 1% of the cap, (3) the toxins released by even a major barge strike would pale in comparison to the toxins released by EPA's chosen dredging remedy, and (4) capping (even when reinforced to all but eliminate the risks of barge strikes) is dramatically cheaper than EPA's preferred removal remedy.

Response: *The EPA utilized the U.S. Corps of Engineers' results, among other factors, to develop the selected remedy for the Site. To clarify the Corps of Engineers' conclusions, the Corp's report, on page 2, under "Permanence of Capping", states "The evaluations performed to address the permanence of the existing repaired TCRA cap with the proposed modifications outlined in the capping Alternative 3N showed that the cap is expected to be generally resistant to erosion except for very extreme hydrologic events, which could erode a sizable portion of the cap." The Corps model simulations of a severe storm also found that "Approximately 80 percent (12.5 acres) of the 15.7 acre TCRA cap incurred severe erosion during the simulated extreme (hypothetical) storm. The maximum scour depth in any grid cell within the cap boundary during this hypothetical extreme event was 2.4 ft (0.73 m). Replacement of the armor materials with a median size of at least D50 = 12 inches would be needed to greatly reduce the amount of scour that occurs during such an extreme event." The Corps of Engineers also performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during this extreme storm event.*

While there are concerns related to barge strikes, as noted in the comment, the impact of potential barge strikes could be mitigated with protective pilings and a thickened cap as was included in the enhanced capping alternative 3aN. However, these protective measures do not result in adequate long-term protection from the impacts of extreme weather events (i.e., severe hurricanes or 500-year rainfall events).

2.5.2 Comment: EPA's reasons for rejecting the capping remedy are untenable. EPA found that, "based on the Corps of Engineers review (Appendix A of the Feasibility Study), a severe future storm could result in significant erosion of 80% of the armor cap and up to 2.4 feet of scour into the waste pits." (Proposed Plan page 32.) But that finding is based on the US Army Corps of Engineers review of only one of the capping alternatives (namely, alternative 3N). The US Army Corps of Engineers specifically recommended additional changes to the capping remedy (such as alternative 3aN) that would not suffer 80% erosion or 2.4 feet of scour in even the most severe and anomalous weather events. EPA's only response is to speculate that it is theoretically conceivable that there are still more severe weather events that no one could foresee, that the US Army Corps of Engineers did not model, and that could theoretically damage even the enhanced and armored cap. EPA does not even attempt to explain, quantify, or justify that speculation. If it were true that EPA could reject any remedy where there is any risk in it— however infinitesimally small, however ill-defined, and however speculative—then EPA could reject any remedy it wanted.

Response: *The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The upgraded cap was simulated using the same severe storm conditions as were used to model the Alternative 3N cap. The results of the modeling showed that erosion of the Alternative 3aN cap would most likely occur over most of the cap during this storm event. The amount (or depth) of net erosion was not determined because sediment transport modeling was not performed.*

EPA disagrees that the reasons for rejecting an upgraded cap are untenable. The primary upgrades for the cap under Alternative 3aN were to add barriers to prevent barge strikes along with an additional 24 inches of armor stone over the armor cap recommended for Alternative 3N. In addition to the recent model studies, several reasons are stated in the Feasibility Study for concern regarding the containment alternatives. The additional armoring for 3aN does not reliably address the issue regarding stream bed stability. Furthermore, the Feasibility Study indicates that the additional weight of the armor stone may push waste out of the sides of the cap. This would cause uncontrolled releases of contaminants.

Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.3 Comment: The preferred remedial alternatives for the northern impoundments (alternative 6N) and the southern impoundment (alternative 4S) involve dewatering of the sediment and soil column. The Proposed Plan did not provide information on wastewater management. The TCEQ requests preliminary wastewater management information such as the contaminants of concern (COCs) to be monitored, threshold COC concentrations in the wastewater prior to disposal, and the method and location of the wastewater disposal. Even though details are expected during the remedial design phase, the TCEQ would like preliminary wastewater management information prior to issuance of the record of decision (ROD).

Typically, total suspended solids (TSS) concentrations in the decant water from dredging activities must not exceed 300 mg/L. In addition, if the decant water is diverted back to the river, the COC concentrations in the water must be protective of TSWQS. The diverted water must be treated, if necessary.

Response: *The selected remedy must comply with Applicable or Relevant and Appropriate Requirements (ARARs). Best Management Practices (BMPs) will be incorporated into the Remedial Design as necessary to support water quality and attainable use standards for this section of the San Jacinto River. On-site water discharges will comply with the substantive technical requirements of the Clean Water Act, but do not require a permit. EPA will work with TCEQ during remedial design to determine the substantive requirements for the Clean Water Act. During a pre-design phase, it is anticipated that collection of samples from the target material would be obtained and analyses such as porewater concentrations would be performed to identify the concentrations of the COCs, which were identified in the risk assessment conducted at the Site, in the untreated discharge wastewater and that based on those results an adequate water treatment system would be designed.*

2.5.4 Comment: Based on the excavation volumes and the number of truck trips projected for remedial alternative 6N, it appears that the EPA is considering the use of 12-cubic yard trucks for the transportation of waste material. The TCEQ suggests the use of larger trucks, if feasible, to reduce the number of truck trips. The TCEQ also suggests that truck routes be determined prior to issuance of the ROD, to identify the neighborhoods impacted by the removal actions, if any.

Response: *The use of larger vehicles may be feasible considering that access to I-10 is only about 1½ miles from the site via the East Freeway Service Road, which is primarily used for non-residential, commercial/industrial traffic and trucking. Transportation of the removed material will be determined as a part of the Remedial Design. The design will consider equipment availability, decontamination requirements, road conditions, site trafficability, access and staging requirements, as well as other factors. If transport is performed by trucks, some road improvements and repair will probably need to be considered in the Remedial Design. The design will evaluate truck routes in an effort to minimize impacts on the local communities. During the design phase, the location of treatment facilities (if necessary) and disposal facilities will be reviewed and selected along with acceptable truck routes. Transportation details is a normal design issue that will be addressed during the Remedial Design.*

2.5.5 Comment: For the preferred remedial alternatives 6N and 4S, the EPA did not specify the location for staging and possible stabilization for the excavated sediment and soil prior to their final disposal. Please provide this preliminary information along with the final disposal facility name and location prior to issuance of the ROD.

Response: *The items requested are normally established during the design phase. Materials disposed in a landfill are required to pass the paint filter test. Mechanically excavated sediments often pass the paint filter test without adding stabilizing agents; however, if stabilizing agents are needed, they may be added in a staging area within the site without the need of a separate off-site staging area. The waste materials and stabilizing agents can be mixed as they*

are loaded onto trucks for transport to disposal. Identification of staging areas and final disposal sites will be performed during the Remedial Design. The selected remedy includes completely enclosing the capped area within a cofferdam for removal. This approach will modify the sediment treatment and handling requirements compared to dredging prior to disposal. A thorough assessment of handling, treating, storing, and transporting will be performed during the design phase.

2.5.6 Comment: Under remedial Alternative 6N, it is not clear if the excavated areas would be backfilled prior to placement of the residual management layer of clean cover; we request clarification. The USAGE report specified three methods of backfill placement – dump placement, rain placement, and best practice placement. We request information on the placement method selected by the EPA and the rationale for the selection, prior to issuance of the ROD.

Response: *The remedial goal for the waste pits area is 30 ng/kg for dioxins with the excavation being accomplished in the "dry" behind a cofferdam. It is not anticipated that a backfill or cover layer will be required as was the case with the former 200 ng/kg remedial goal because all of the waste will be removed. However, the cofferdam fill materials (sand or dredged material from outside of the waste pits) may be distributed across the site upon completion and removal of the cofferdam.*

2.5.7 Comment: Estimated construction time for remedial Alternative 6N is 19 months. That appears to be a radical under-estimate of the true construction time. And if EPA has underestimated the construction time of Alternative 6N, it will make that remedy even less cost-effective than it otherwise appears. The TCEQ requests the EPA explain how this construction time is estimated.

- Does the construction period include the time required for best management practice (BMPs) installations prior to the commencement of work?
- Is the construction expected to occur on a 7-days per week schedule or a 5-day per week?
- How many work shifts are estimated and what are the durations of shifts?
- Were allowances made for stoppage of work during hurricane season, storms, etc.? If so, what are the allowances?

Response: *The construction time estimate for the Alternative 6N presented in the Proposed Plan and the Feasibility Study was 19 months. However, with the adoption of excavation in the "dry" behind a cofferdam, the construction times have increased based on input from the U.S. Corps of Engineers. Further, the construction time estimate will be reviewed during the design phase and updated as appropriate as the more detailed design is developed. The construction time for the selected remedy is currently 27 months. The total time required for construction is equal to the time required to install the cofferdam (19.3 months), to complete removal activities (4.3 months), and to dismantle the cofferdam (3.3 months), assuming 10-hour work days and 6-day work weeks.*

There are many project case histories which demonstrate that the former 19-month schedule is within reason. One example is the Sheboygan Harbor Sediment Dredging project. This project occurred in upstate Wisconsin. Dredging of 170,000 cubic yards of PCB contaminated sediment

was completed in 8 months. The construction season in upper Wisconsin is drastically affected by cold weather. Clearly a construction schedule of 19 months falls within the realm of reason. But as with any construction project there are always conditions that are not anticipated, which require schedule adjustments. A second example is provided by Ashtabula Sediment Removal. Construction funding for the project was received in December 2005. In late May 2006, the construction of the onsite landfill including water treatment system for sediment dewatering in geotubes was completed. The final dredge plan was approved in June 2006. Dredging commenced in September 2006. At the end of October 2007, 413,530 cubic yards of PCB contaminated sediment had been successfully removed from the river. A third example is the Passaic River Phase I Removal, which was completed in 18 months, involving mechanical dredging of approximately 40,000 cubic yards of dioxin contaminated sediment and debris inside a sheet pile wall enclosure with sealed joints, structural reinforcement of an adjacent bulkhead, hydraulic conveyance of dredged material slurry within 1,400 feet of pipeline to a constructed water treatment and sediment processing facility, and transportation/off-site disposal of processed dredged material. Work occurred between July 2011 and January 2013. These case studies demonstrate the appropriateness of a 19-month schedule for Feasibility Study purposes. Actual work schedules are established by the contractor and typically are set at 6 days per week and 10 hours per day. The contractor also will account for repairs and downtime for weather related issues in the overall construction schedule.

2.5.8 Comment: Under Primary Balancing Criteria on Page 34, excavation volume for alternative 6N was listed as 200,100 cubic yards. It appears that it is a typographical error and it should be 152,000 cubic yards.

Response: *Typo noted; the quantities will be clarified in the Record of Decision. The excavation volume for the selected remedy 6N is 162,000 cubic yards reflecting a reduction of the cleanup level to 30 ng/kg.*

2.5.9 Comment: Estimated costs for remedial alternative 3N and 3aN should include present worth cost for repairing cap erosion from weather events expected during the life of the armored cap (the US Army Corps of Engineers report). Evaluation of the San Jacinto Waste Pits Feasibility Study Remediation Alternatives dated August 2016 modeled a potential for an 80% erosional loss during a major storm). Multiple erosional events are possible over centuries so major repairs should be accounted for in the proposed costs associated with these alternatives. Present worth costs for repairing damages to the armored cap due to all projected events are necessary to ensure that adequate funds are available for the life of the armored cap.

Response: *As detailed in the Record of Decision, the cost estimates for the containment alternatives, including Alternatives 3N and 3aN as well as the others, incorporate an annual operation and maintenance cost of $100,000 per year to provide for the costs associated with cap repairs, exposed waste, and repairs of riverbed erosion as has been experienced in the 6 years following completion of the cap, and also to provide for future repairs that may be necessary following hurricanes.*

2.5.11 Comment: Under remedial alternative 4N, the EPA proposed construction of an upgraded armored cap, as described in alternative 3N, over solidified and stabilized waste material. To ensure better containment of waste material, EPA should consider construction of

an enhanced armored cap per remedial alternative 3aN, in accordance with the US Army Corps of Engineers recommendations. This change would reflect a change in cost from 3N to 3aN.

Response: *There are a number of environmental conditions that affect the long-term permanence of a cap in the San Jacinto area. Even with the Alternative 3aN design, the principal threat waste and the potential for release of dioxin containing waste is not eliminated as with Alternative 6N. However, an enhanced armor cap in accordance with Alternative 3aN would be appropriate if Alternative 4N had been selected.*

2.5.12 Comment: Under remedial alternative 5N, the EPA proposed construction of an upgraded armored cap, as described in alternative 3N, over the excavated area. To ensure better containment of waste material, please consider construction of an enhanced armored cap per remedial alternative 3aN in accordance with the US Army Corps of Engineers recommendation. Also, please revise the costs to reflect this change from 3N to 3aN.

Response: *There are a number of environmental conditions that affect the long-term permanence of a cap in the San Jacinto area. Even with the Alternative 3aN design, the principal threat waste and the potential for release of dioxin containing waste is not eliminated as with Alternative 6N. However, an enhanced armor cap in accordance with Alternative 3aN would be appropriate if Alternative 5N had been selected.*

2.5.13 Comment: Under remedial alternative 5aN, following the removal of waste material, the EPA proposed covering the waste material removal area with a residuals management layer of clean cover. It is not clear if the excavations would be backfilled prior to placement of the residuals management layer; please clarify.

Response: *Under Alternative 5aN the removed material would not be backfilled and only a residuals management layer would be used to cover the dredge residuals. This will be clarified in the Record of Decision.*

2.5.14 Comment: The Proposed Plan does not provide specific plans for transportation of the dioxin waste, disposal of the dioxin waste at an authorized waste disposal facility, or preventing and responding to the release of the dioxin waste into the environment during transit to the dewatering and stockpile staging area. According to the feasibility study, the sludge and sediment at the Site do not contain a listed hazardous waste and do not meet the characteristics of hazardous waste. It is recommended the EPA perform a thorough hazardous waste determination and classification, including a listed waste review, to ensure the dioxin waste is disposed of per the Resource Conservation and Recovery Act (RCRA), if applicable, and/or the Texas Solid Waste Disposal Act (TSWDA). Furthermore, it is recommended a waste management plan be developed that utilizes Best Management Practices (BMPs) for waste transport. Harris County requests that the following BMPs be included in the waste management plan: enclosed transportation vehicles to prevent leaks or loss of material; maintaining a contract with an entity capable of cleaning up and properly disposing of the dioxin waste in the event that a spill/release occurs; and an EPA approved formal contingency plan should a release occur during transit to the approved disposal facility.

Response: *The site remediation is required to meet applicable or relevant requirements and, as such, the waste and sediment testing and disposal will meet the standards required by State and Federal regulations. The requests listed in the comments are standard components of a Superfund sediment remediation design and work plans. The spill plan includes a notification and response plan for any transport spills as well as contingencies to address spills, leaks and accidents. Transport vehicles will be lined, covered, or sealed to minimize losses during transport.*

2.5.15 Comment: The Proposed Plan does not address the prevention and management of potential releases during the dewatering of the dioxin waste in the processing areas. The processing areas should meet the location standards required by State and Federal regulations. In order to prevent releases of dioxin waste to the environment, the dewatering area should be completely enclosed. Harris County requests that a formal contingency plan be prepared in case of a major storm event. Furthermore, a spill prevention and control plan should be in place that requires secondary containment, and that the processing area be designed to contain and prevent spills from leaving the Site. In order to prevent nuisance conditions to nearby receptors, the staging area should be isolated from residential properties and odor/dust control measures should be taken. Contaminated water or other wastes generated during the treatment process should be minimized and disposed of at an authorized facility.

Response: *The site remediation would be required to meet applicable or relevant requirements and, as such, the processing areas should meet the standards required by State and Federal regulations. Contingency/spill/dust/decontamination/air monitoring plans will be prepared for the implementation work plan during the Remedial Design or would be developed as part of contractor plans in accordance with design specifications. Appropriate secondary containment would be required to capture contaminated water for treatment, and contaminated materials for disposal at an authorized facility. These practices are standard for remediation of Superfund sites. EPA acknowledges the comment from Harris County and recognizes the concern for Harris County residents and nearby citizens. These concerns will be taken into consideration throughout the remedial design. There are a number of options which can be implemented to contain and control the excavated material including the use of passive and active technologies. Odor and dust are an issue that is of concern at all excavation sites. As mentioned above the design documents will be available for review prior to accepting a final design.*

2.5.16 Comment: Harris County endorses EPA's Proposed Plan to develop a comprehensive erosion and dust mitigation strategy prior to mobilization including temporary cover(s) within the exposed waste pit area(s) during the excavation process. We encourage the EPA to develop a sustainable execution plan that incorporates use of these temporary cover materials into the permanent cover and fill for the Site.

Response: *There are a number of techniques that are used to minimize erosion and control fugitive dust emissions from contaminated sites. These items along with other best management practices will be fully explored, assessed, and included in the design plans as necessary. The work plan developed for implementing the remedy will include provisions for containing and controlling losses from excavated waste material. EPA acknowledges Harris*

County's comment regarding sustainable elements and the request to include those elements into the remedial design when possible.

2.5.17 Comment: Although Harris County agrees with the "dry" excavation approach, we recommend that the EPA investigate the use of single mobilization/demobilization including installation of the sheet pile cofferdam around the entire excavation footprint. The work within the cofferdam could be performed in multiple stages to reduce risk of erosion of contaminated sediment in the event a flood occurred during remediation. However, we do not see a need to perform mobilization and sheet pile installation in multiple stages, which would increase costs.

Response: *The removal is proposed to be performed in the "dry" by dewatering the site. The cofferdam would be constructed to fully contain the site before cap removal and sediment excavation, eliminating the need for multiple mobilization/demobilization operations for sheet pile installation. Runoff from both small and major storm events would be collected along with seepage in a sump within the cofferdam and then pumped to a water treatment plant. Solids collected in the sump would be excavated prior to completion. The cofferdam would be constructed to prevent inundation except for major flood events. With containment by a cofferdam, removal would not need to be performed in stages or sections to restrict resuspension and residuals.*

2.5.18 Comment: Harris County agrees with the EPA that onsite passive/active dewatering of the excavated waste material would decrease subsequent costs of transportation and disposal by decreasing the mass of material as well as decrease risk(s) of spills during transportation to an off-site disposal facility. Unless mandated by the designated disposal facility, on-site stabilization by the addition of Portland Cement or another bulking agent would increase the mass of material to be transported and disposed of in an off-site landfill. Harris County recommends dewatered sediment that meets a designated dryness threshold (e.g. pass paint filter test and no free liquid in transport vehicles) be sealed in "burrito bags" and safely transported by truck and/or rail to an appropriate disposal facility.

Response: *Materials disposed in a landfill are required to pass the paint filter test. Mechanically excavated sediments may pass the paint filter test without adding stabilizing agents but these organic sludges are not typical of sediments and may require a mechanical dewatering process. If stabilizing agents are needed, they may be added in a staging area within the site without the need of a separate off-site staging area. Similarly, the waste materials and contaminated sediment could be stockpiled within the site to permit the free drainage of water from the materials to satisfy the dewatering requirements. Use of "burrito bags" (liner for containing waste materials during transportation) is also an option. Off-site processing using belt filter presses or other mechanical means is also an option for dewatering excavated materials. Methods and materials for dewatering will be developed during the Remedial Design. All water generated from the excavated sediment would be collected, treated, and disposed of according the approved methods. The waste materials and stabilizing agents can be mixed as they are loaded onto trucks for transport to disposal. Information on off-site staging areas and final disposal sites are not available at this time. Identification of staging areas and final disposal sites is performed during the Remedial Design. EPA acknowledges Harris County's*

comment and will consider the approach during design development and preparation of the transportation plan.

2.5.19 Comment: Harris County requests that the EPA require the Potentially Responsible Parties to undergo third-party oversight as part of any final remedy for the Dioxin Pits.

Response: *EPA plans to provide an oversight contractor during construction activities. In addition, EPA personnel along with other state and local agencies are anticipated to review ongoing activities throughout construction.*

2.5.20 Comment: What measures will be taken to armor the active excavation against flooding?

Response: *As described in the Feasibility Study, the Remedial Design will include elements to minimize the flooding of the "dry" excavation area. The exact elevation for sheet pile installation, or other cofferdam approach, will be determined during the design phase. The preferred alternative has been modified for the selected remedial action to include a cofferdam that will encircle the entire capped area. This includes installation of the sheet pile to elevations above which flooding is reduced. The Feasibility Study states "Containment structures to reduce resuspension would consist of berms and sheet pile walls or caissons to an elevation of about +10 NAVD88 (protection from 25-year or 50-year flood stage). If performing excavation of the waste materials in the "dry", the top of the berms would preferably be no lower than +5 NAVD88 (protection from 5-year or 10-year flood stage)." EPA anticipates protection from flooding the cofferdam for appropriately conservative flood events, which may be 25- year, 50-year, or less frequent depending on the remedial design process.*

2.5.21 Comment: I'm concerned about digging it up and the trucking of the waste to another location. I'm wondering if there's not more risk moving it due to wrecks while transporting it. What's going to happen if it floods while the construction is occurring?

Response: *A health and safety plan will be prepared during the Remedial Design for the site to deal with any contamination during excavation, transportation, and dumping of the waste. An extensive experience base has been developed from contaminated sediment sites throughout the United States and provides examples of many successful operations. The potential spills of the wastes and contaminated sediments do not pose substantial short-term risks. The materials are not considered hazardous under RCRA and DOT regulations since the materials are not ignitable/flammable, corrosive, reactive or toxic as characteristic of hazardous materials. Risks develop from the long-term dermal exposure or ingestion of the contaminants. The Remedial Design will develop contingency plans to prevent long-term exposure and spill control plans, including those resulting from vehicle accidents. The wastes would be contained in sealed and covered trucks and the trucks will be decontaminated before leaving the site to control releases of contaminants.*

2.5.22 Comment: In 2011 the temporary cap was placed over the waste area. It was my understanding that it's holding much better than what I've heard tonight; and knowing that a

permanent cap would only reinforce what is there, why would we open ourselves and more people up to the damage this waste could cause if it is disturbed?

Response: *The long-term effectiveness of this alternative is dependent on the continued integrity of the armored cap and well as the river dynamics including subsidence and geomorphological changes. The dioxin within the waste pits was generally isolated from potential receptors by the temporary cap, but the temporary cap has required many repairs and extensive maintenance. Examples include, in December 2015, an area of missing rock that was found by the EPA Dive Team. This area was not identified by the regular inspections that had been done since the temporary cap construction was completed. Dioxin at 43,000 ng/kg was under water exposing the environment and potential receptors to the dioxin. Repairs to this area were completed in early 2016. Other instances of thin or absent rock cover were identified in 2012, 2013, and in 2016. No flood since the cap was constructed in 2011 has exceeded a 100-year return period design flood. As indicated in section 4.3.3a the Feasibility Study, there is a high degree of uncertainty regarding the long-term permanence of the cap even with the improvements (Alternative 3aN) for an enhanced cap.*

2.5.23 Comment: I'd also like to know more about how you're going to contain it when a hurricane comes through when you've got it dug up for us further down the road?

Response: *EPA recognizes there are potential problems from flooding. The Preferred Alternative 6N has been modified for the selected remedial action and the entire capped area will be enclosed within a cofferdam. This will help control resuspension and release of sediments. However, in the event the cofferdam may be overtopped, the concerns will be reviewed during the remedial design phase and will include provisions to address potential problems associated with storm events. There are remedial approaches that could include the use of temporary cover with a geomembrane or geotextile as well as geotubes for temporary containment prior to disposal. Various approaches will be considered to minimize the problems and risks associated with dredged material in various stages of transportation, treatment, and storage.*

2.5.24 Comment: Our office is aware of some of the concerns with dredging. We are also aware that the EPA will put in place controls that will limit possible spreading of contaminated soil during the cleanup and follow best management practices recommended by the Army Corps of Engineers, including doing the cleanup in stages to limit exposure from potential storms.

Response: *EPA recognizes the importance of protecting the general public from all risks associated with the cleanup of the contamination at the San Jacinto River Superfund site. All necessary precautions will be reviewed and assigned as appropriate to minimize potential exposure of the local residents to contaminants associated with the site as well as the construction activities resulting from remedy implementation.*

2.5.25 Comment: We request that the third party oversight personnel report directly to and work directly with the EPA and not the PRPs. In the past 12 months, the EPA has held the PRPs to higher standards and this could not have come soon enough for those who live and work near the Pits. Additionally, the EPA took over the completion of the Remedial

Investigation/Feasibility Study after multiple attempts by the PRP's consultants. We cannot stress enough the importance of EPA to continue to hold the PRPs to the highest standards to ensure the process continues moving forward with compliance and objective quality assurance.

Response: *EPA will manage the oversight of the remedy design, implementation, and monitoring.*

2.5.26 Comment: We ask that the EPA produce an on-site safety plan and consider a decontamination zone for equipment and vehicles leaving the Site. It has been reported to the Coalition that equipment used on Site to-date has not undergone decontamination before it is returned to the rental company. That would not only potentially transport contaminated material off-site, but it would also potentially expose those who then clean the equipment without proper personal protective equipment (PPE). Additionally, we ask the EPA to ensure that on-site workers are wearing appropriate PPE. The health of nearby off-site workers should also be considered.

Response: *A site safety plan will be prepared as part of the remedial design process. This plan will include provisions for controlling the spread of contaminated sediment from the site. Typically, the site should have tire wash basins for trucks leaving the site. Also, if rental equipment is used, a process will be decontaminated to ensure the appropriate steps are taken to clean the items before returning them to the rental vendor. EPA will include appropriate measures in the remedy design to address these important factors.*

2.5.27 Comment: The Coalition is confident in the EPA's proposal for removal of the San Jacinto River Waste Pits, however, we acknowledge that there are risks associated with removal. Such risks are more predictable than risks associated with all other remedial alternatives but we encourage the EPA to take every possible measure to mitigate risks and ensure Best Management Practices (BMP) are employed. The Proposed Plan states that BMPs will be used but it does not explain what the BMPs are. The US Army Corps of Engineers Evaluation of the San Jacinto Waste Pits Feasibility Study Remediation Alternatives offers BMPs to minimize potential loss that could occur during remediation. We want to stress the importance of using BMPs to safeguard the environment, the health of community members and site/nearby workers, as well as Galveston Bay.

Response: *EPA has modified the preferred alternative to include a cofferdam to completely encircle the capped area prior to removal. This approach will provide an added measure of control on contaminated sediment release. Application of additional best management practices will be reviewed during the design phase. Selection of the best management practices is most appropriately left to the design phase. There are many different operations and phases of the project. Specifying in advance the applicable measures may necessarily omit an important measure. Development of the design is a logical stepwise process. Once the alternative is selected a detailed design will be prepared including the essential best management practices.*

2.5.28 Comment: The Proposed Plan states the estimated construction time for Alternative 6N is 19 months and 7 months for Alternative 4S. We ask that you time the start of construction with

careful consideration. Community members have suggested starting the early stages (building berms, etc) during hurricane season so once we are cleared from that hurricane season, dewatering of the site, removal of the TCRA and excavation of the waste material can begin.

Response: *The scheduling of activities will be developed in the work plan after the Remedial Design is completed. The site will remain covered with the armored cap until the cofferdam encircling the site is completed, maintaining the current level of protection at the site. The site would need to be dewatered before removal is started and then maintained in a dewatered condition throughout the sediment removal operation. As indicated in other comment responses, incremental or phased removal would occur to control the amount of open excavation area exposing waste materials. The work plan will consider typical river flows, water stages, storm seasons, construction steps, durations and logistics as well as other factors to optimize the production and project performance. The design will include provisions and steps for implementation to minimize releases resulting from flood conditions.*

2.5.29 Comment: We support the plan for the waste to be transported to a permanent permitted facility but we encourage all options to be identified during the design phase.

Response: *Comment noted.*

2.5.30 Comment: It should be known that we do not support incineration. We do not want this to be a "not in my backyard" issue.

Response: *Comment noted. Incineration is not a technology currently under consideration for waste treatment. The dredged material will be sent to an appropriate permitted landfill.*

2.5.31 Comment: The temporary cap was designed to withstand a 100-year flood event, which we have not experienced in recent years. Yet the cap has undergone several repairs and has failed to meet design expectations during the 5 years it has been in place. Most concerning was the 25 x 22ft deficiency in the temporary cap discovered in December of 2015, which validates concerns that the cap is insufficient in the long-term. These concerns are strengthened by the uncertainty of how the deficiency was created or when. Sediment samples grabbed near the deficiency referenced above confirmed upwards of 43,000 ppt of dioxin openly exposed in the River, further supporting the concern that containment is not a solution.

Response: *Comment noted. EPA is concerned about the long-term effectiveness of the cap covering the contaminated sediment. In section 4.3.3a of the Feasibility Study, concern is expressed regarding the stability and integrity of the cap even with the addition of more cap armoring.*

2.5.32 Comment: In the immediate vicinity of the San Jacinto River Waste Pits are four large shipyards and barge facilities. Tug boats, barges and privately owned boats navigate past the site on a regular basis. Any given day residents can count upwards of 70 barges in the immediate vicinity of the Pits. The U.S. Army Corps of Engineers (USAGE) estimates there is about a 1 in 100 probability of a significant strike and about a 1 in 12 probability of a minor strike within a

given year. Due to heavy barge traffic in close proximity to the Waste Pits, we feel that the probability of a strike is greater than the USAGE Report estimates. Furthermore, the USAGE estimations are based on national averages and not actual local data.

Response: *Comment noted. The US Army Corps of Engineers has included many assumptions for a variety of assessments in the report. Barge strikes are only one of the concerns regarding the long-term success of a permanent cap, which is not selected as the final remedy for the Site. The barge traffic will be taken into account during as the removal design is prepared.*

2.5.33 Comment: Interstate 10, a major federal highway, straddles the SJRWP site between the northern and the southern impoundments. The vulnerability for barge strikes in this area is further confirmed by the 5 dolphin bridge protection structures directly across the river channel from the northern impoundment. The structures were constructed in 2006 by the Texas Department of Transportation to protect the Interstate 10 bridge from a barge strike. At some point in the future. Interstate 10 will be need significant maintenance work or will need to be expanded.

Response: *Comment noted. Removal of the waste materials per Alternative 6N will avoid conflicts that may otherwise occur for capped areas compared to the footprint of future infrastructure expansion.*

2.5.34 Comment: How are the objectives met when the sediments will be disturbed during full removal? Objectives include prevent releases of dioxins from the former impoundments; reduce human exposure to dioxins from consumption of fish; reduce human exposure to dioxins from contact with contaminated materials; and reduce exposures of benthic macroinvertebrates (clams, crabs, etc.) to dioxin. In all candor, the proposed plan fails to clearly demonstrate how any of these objectives will be met.

Response: *The disturbance of sediments during removal is unavoidable based on excavation as the selected alternative. The EPA intends to completely surround the capped area with a cofferdam and perform the removal in the "dry" to control releases of contamination. To minimize and control disturbance of sediment during removal of the northern waste pit, the selected remedy proposes to incorporate best management practices identified and recommended by the US Army Corps of Engineers, and may require other best management practices not mentioned by the US Army Corps of Engineers depending on the remedial design development. The final use and design of best management practices will be determined during the Remedial Design. The EPA shares commenters' concerns about providing for a remedy that addresses risks to the health and wellbeing of everyone who lives near the site, and the remedial design of the selected alternative will address these concerns. To reduce human exposure to dioxins from consumption of fish; reduce human exposure to dioxins from contact with contaminated materials; and reduce exposures of benthic macroinvertebrates (clams, crabs, etc.) to dioxin, the selected alternative is the most protective by removing the waste material. There are no preliminary remediation goals for fish tissue because the required sediment cleanup measures at the Site will reduce contaminant concentrations in tissue, but these concentrations will continue to be affected by factors outside the scope of the Comprehensive Environmental*

Response, Compensation, and Liability Act Site cleanup, including upstream and downstream PCB and dioxin inputs from other sources. Measuring trends against target tissue concentrations is useful for assessing risk reduction and for risk communication, but tissue preliminary remediation goals are not required to evaluate these trends. The continued containment of the waste beneath an enhanced cap will not remove the threat of a potential release to the environment.

2.5.35 Comment: What will be the final disposition (waste disposal) of the removed material?

Response: *The removed material will be transported to and disposed of at an approved permitted disposal facility. The disposal facility will be determined during the Remedial Design.*

2.5.37 Comment: How will transportation of the removed material to the disposal facility be managed?

Response: *Excavated waste material would be gravity dewatered and stabilized by the addition of Portland Cement or other additive at the Site or offloading location, as necessary, to eliminate free liquids during transportation. Alternatively, the remedial design may determine that mechanical dewatering approaches such as filter presses are appropriate for dewatering and waste volume reduction. Approximately 13,300 truck trips (northern impoundment) may be required to transport the waste material under the scenario of gravity dewatering and stabilization with Portland Cement. Several factors, such as weight capacity of the road, size of the truck, most direct route, and potential alternative means of transportation will be evaluated and determined during the Remedial Design.*

2.5.38 Comment: Are there any in-place or on-site treatment options?

Response: *Yes. Several treatment technologies, including thermal (in-pile thermal desorption) and chemical (solvated electron technology and base catalyzed decomposition) processes, were also considered for use at the Site but were not included as a remedial alternative, as discussed further in the Feasibility Study. The Feasibility Study contains a detailed analysis of each alternative against the criteria and a comparative analysis of how the alternatives compare to each other.*

2.5.39 Comment: Who will repair, maintain, and pay for this work through the life of the cap?

Response: *The Potentially Responsible Party would be required to fund all maintenance and repairs to the cap.*

2.5.40 Comment: Why remove the material from the north pits but not the south pits?

Response: *The area south of I-10 will be excavated as indicated on Page 31 of the Proposed Plan. It is estimated approximately 50,000 cubic yards of material will be removed as part of Alternative 4S.*

2.5.42 Comment: The EA Memorandum states 76% of the material is assumed to be removed in the "dry" and in other locations assumes that 100% of the material will be removed in the "dry".

Response: *As described in this Responsiveness Summary and the Record of Decision, the selected remedy includes removal of all waste material in the "dry" behind a cofferdam. Prior to the final remedy selection, a combination of "dry" excavation and underwater dredging was considered. Regarding the EA Memorandum, it states that approximately 76% of the material will be excavated in relatively "dry" conditions, estimated by the percent area of excavation within the Western and Eastern Cells vs total excavation within the Armored Cap Limits. The commenters statement indicating other locations in the EA Memorandum assumes 100 percent of the material will be removed in the "dry" could not be found or verified during review of EA's Memorandum.*

2.5.43 Comment: As part of the Operation, Maintenance, and Monitoring (OMM) Plan, cap maintenance has been performed in small discrete areas of the armored cap as contemplated by the OMM Plan, and supplemental security measures have been implemented.

Response: *The area discovered by EPA in 2015 revealed the rock cap was not present over the waste material in an area measuring approximately 400 square feet. The lack of the rock cap exposed dioxin material containing dioxin concentrations over 40,000 nanogram/kilogram (ng/kg), which is many times higher than the risk based sediment protective level of 30 ng/kg. This area was not underlain by geotextile material and rock was found to have sunk several feet or more into the waste material. This occurrence points to the need to carefully consider the load bearing capacity of the waste, especially with the potential addition of weight from the addition of several feet of larger armor stone over much of the cap, as envisioned for the upgraded cap in Alternative 3aN.*

Bulk sediment sampling downslope from the exposed area did not find any indications of a gross release of paper mill wastes; however, EPA must make clear that this area was underwater and no data is available to evaluate how much dioxin was transported away from the site by the flow of the river during the unknown amount of time the waste was exposed due to the failed area of the cap.

2.5.44 Comment: Region 6 discounts the significant releases that the US Army Corps of Engineers concludes (and Region 6 acknowledges) will result from Alternative 6N.

Response: *The release of waste during removal was not discounted in the evaluation and selection of Alternative 6N. In fact, a range of best management practices were considered and evaluated to reduce releases to a minimum during implementation of Alternative 6N. The capped area will be completely surrounded by a cofferdam to perform "dry" excavation. As stated in the US Army Corps of Engineers report, dredging releases 2-4 percent without sheet piling, 0.2 percent with sheet piling and 0.34 percent if sheet piling is impractical for the northwest area. It is unclear if the US Army Corps of Engineers study included use of sealed joints (interlock sealant or joint compound) for sheet piles, which would further reduce release and would be a likely requirement of remedial design. The remedial design of engineering control measures and*

required best management practices will be developed to address many of the issues identified in the US Army Corps of Engineers report that are expected to significantly reduce releases compared to US Army Corps of Engineers estimates.

2.5.45 Comment: The August 2016 Corps of Engineers report concluded that excavation of the waste material will necessarily result in significant releases of dioxin in the San Jacinto River, even with the use of enhanced BMPs.

Response: *Based on comments, EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam to control releases during the removal phase. The most significant losses from the US Army Corps of Engineers report were based upon use of a silt curtain for dredging areas, which is no longer applicable. Other assumptions of releases are based on several assumptions. These assumptions include the amount of sediment adhering to the geotextile upon removal, the COC concentration in the adhered sediment, the amount of sediment released from the geotextile upon removal, and the amount of released sediment lost during the operation. All of these assumptions, while of concern, have a high degree of uncertainty. Many of these potential issues are addressed by removal in the "dry" inside a cofferdam. All of these potential issues will be addressed in the design phase and best management practices can be developed to manage and minimize the releases.*

2.5.46 Comment: Alternative 3aN features will enhance its long-term protectiveness and reduced the need for future maintenance.

Response: *There are concerns regarding the long-term performance of the cap even with the additional armoring specified in Alternative 3aN. While the additional capping features will help improve the effectiveness of the cap it does not adequately and reliably contain the waste for the long term. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.5.47 Comment: The Proposed Plan minimizes the implementability challenges associated with its preferred alternative.

Response: *The Proposed Plan provides a summary of the challenges associated with the preferred alternative. Based on comments received on the Proposed Plan, EPA intends to surround the capped area with a cofferdam and perform the removal in the "dry". This will alleviate many of the implementability challenges associated with Alternative 6N.*

2.5.49 Comment: Does EPA have any plans to resample the Sand Separation Area prior to fleshing out the details of the corrective action plans? This is based on the damage to the

vegetated east bank of the river and eroded significant portions of Short and Long Islands during the May and June 2016 floods.

Response: *The Sand Separation area will be resampled during the Remedial Design. A standard practice includes collection of samples in the design phase to address various design elements. The capped area and areas immediately adjacent to the capped area will be reviewed to determine any necessary sample collection to fill data gaps that may be required to complete the design.*

2.5.50 Comment: In the event that restrictive covenants are placed on the Sand Separation Area and other areas with a preliminary remediation goal of 30 ng/kg, would these "restrictive covenants" be administered equally to all barge fleeters and operators?

Response: *Yes.*

2.5.51 Comment: We would like to see a more aggressive approach to addressing the Sand Separation Area that will allow this area to have unrestricted use of the area, except as imposed by other regulating entities.

Response: *Comment noted. However, the selected remedy includes monitoring for this area for the reasons outlined in the Record of Decision including lower concentration levels and concerns about sediment residuals and resuspension during removal.*

2.5.52 Comment: Please clarify the inconsistencies concerning the protective berms being left in place after construction. Page 28-29 of the Proposed Plan indicates; "in place after construction to provide a barrier, limiting barge and boat traffic over the site". The closing statement of Alternative 6N indicates; "The current temporary cap has had no impact on navigation, and this alternative is not expected to be different".

Response: *Noted. EPA will further clarify this comment during development of the Record of Decision. However, the modified Preferred Alternative will include installation of a cofferdam completely encircling the capped area for removal in the "dry". The cofferdam will be at least partially removed once excavation has been completed.*

2.5.53 Comment: Is there going to be a "safe zone" around the Site to restrict barge and boat traffic in the vicinity of the protective berms during post closure care?

Response: *Barge and boat traffic routes around the Site will be evaluated during the Remedial Design phase and will be coordinated with the proper regulatory agencies. Based on the conceptual design of the selected remedy, the existence of long-term protective berms is not anticipated. Aids to navigation maybe required during construction and will be developed as necessary during the design phase.*

2.5.54 Comment: How far from the berm will the armor extend and how will it affect barge and boat traffic?

Response: *The selected alternative is removal behind a cofferdam. Nevertheless, not all of the armor cap will be removed because the underlying material is already below the remediation goals. These areas are well outside of the river channel and barge routes.*

2.5.55 Comment: How will the berm armoring be structured to remain stable under extreme storm events in light of the fact the current cap has not been able to do so?

Response: *The selected remedial action is excavation of the contaminated waste within a cofferdam. The comment addresses an alternative that is not being considered for implementation.*

2.5.56 Comment: We operate only shallow draft vessels (barges and tugs) that have minimal impact on sediment resuspension or redistribution. In weighing the risks and rewards, we believe that retaining the berms after the removal action is complete may be unnecessary.

Response: *The preferred alternative has been modified and the capped area will be completely encircled with a cofferdam. The cofferdam will be either removed or cut off at the mudline once the project is complete. The final disposition of the existing berms will be determined during the remedial design.*

2.5.57 Comment: Since we will be the only operating river fleet in the vicinity of the Site, we will, in effect, serve as post closure care custodians of the Site.

Response: *The post closure care custodians for the Site will be the potentially responsible party and regulatory authorities charged with protection of the environment.*

2.5.58 Comment: The elimination of the berms as part of the post closure remedy could potentially make the Site vulnerable to major flood events but the berms will have the unintended consequences of achieving the very thing they are designed to prevent – a cap breach. Installing any structure that directs flood flow away from the Site will have the unintended effect of restricting flood flow in the San Jacinto River. This will create a funnel or nozzle effect that increases flow velocity and erosive power, which translates into river scours around the sheet piles as well as the Interstate 10 bridge piers. Based on observations of the effects of flooding along the San Jacinto River, there is little confidence that any post closure structures will survive in the long-term.

Response: *The selected remedial action is for removal of the contamination behind a cofferdam encircling the site. As indicated in the comment, the cofferdam would have the potential to restrict the cross-sectional area of flow under I-10 during flooding events with a stage above seven feet NAVD 88. The reduction in cross-sectional area would be small and the impact on velocities and bottom shear stress would therefore be small as well. The approach velocities to the channel under I-10 would also be somewhat affected along the east side of the northern site, increasing slightly more than the changes that occurred as a result of the armored capping. Consequently, the cofferdam would be protected with armor stone, and potentially other engineering control measures, to reduce erosion. The cofferdam is expected to be in place for only about two years; therefore, the potential for impacts on flow and erosion would be a*

short-term consideration, leading to a low probability of impacts compared to a permanent cap. There will not be any post-closure structures because the cofferdam will be removed or cut off at the mud line following removal of the waste material.

2.5.59 Comment: Based on observations of the effects of flooding along the San Jacinto River, there is little confidence that any post closure structures will survive in the long-term.

Response: *No post closure structures are anticipated at this time. Ongoing evaluation of cap performance will be performed as part of the Operation, Maintenance and Monitoring Plan and be the responsibility of the potentially responsible party to maintain the structures untile the final remedial action is implemented.*

2.5.60 Comment: Is EPA's object here to totally prevent flood waters from inundating the Site or to just minimize scour potential from unabated flood currents? EPA states on page 35 of the Proposed Plan that the sheet pile walls are currently planned at no higher than 10-feet NAVD88 and no lower than 5-feet NAVD88. Based on these specifications and the May and June 2016 flood events (classified as 500-year events) and visually observed river levels at the 12-foot mark of the flood gauge, we have little confidence in the long-term viability of sheet piles or caissons.

Response: *The exact elevation for the sheet pile walls/cofferdams will be determined during the design phase, with the goal of minimizing flood impacts.*

2.5.61 Comment: Does EPA have any plans to work with TXDOT in making improvements to the I-10 right-of-way feeder that will accommodate the high traffic volume and alleviate delays due to high water events?

Response: *A final determination of transportation options will be made during the Remedial Design phase. It is the intention of EPA to have the potentially responsible party include State and local transportation agencies involved with planning to ensure safety and reliable mobility.*

2.5.62 Comment: Any restrictions to barge operations in the area of the Site could upset the tenuous equilibrium in river and inter-coastal water way traffic that would not only worsen traffic problems in the Houston, Texas City, and Galveston ship channels, but would also impact incoming traffic as far away as Mississippi and Brownsville. In addition, this could force barge operators to park in areas of "no-parking" or scofflaw areas south of the I-10 bridge.

Response: *Comment noted. These waterway operations will be given full review during the design phase in order to minimize potential conflicts with waterborne commerce. It is anticipated that the footprint of the remedy should not change a great deal from the existing footprint.*

2.5.63 Comment: How many trucks will be necessary to transport the waste material to another landfill? How far away is this other landfill? What is the probability of a traffic accident during transportation and disposal?

Response: *The location and type of final disposition for the waste has not been determined but will be during the Remedial Design. Based on the preliminary estimate, approximately 13,300 truck trips maybe required. There is always the potential for traffic accidents and a transportation plan will be developed to reduce that potential.*

2.5.64 Comment: USEPA did not adequately justify the rejection of an in-place containment remedy that would isolate the waste material in perpetuity and prevent the migration of dioxins and minimize human health and environmental risks during construction.

Response: *EPA disagrees with the comment. The best means to protect human health and the environment is through removal. Currently, EPA anticipates removal by encircling the capped area with a cofferdam and conducting excavation in the "dry". The current historical cap performance demonstrates the ineffective ability of a cap in this setting and supports the importance of removing the dioxins/furans from the system. The long-term effectiveness criteria are best addressed by removal.*

2.5.65 Comment: In-place containment would minimize risks of a catastrophic failure during a large-scale mass removal remedy that has not been quantified nor appreciated by USEPA.

Response: *EPA plans to remove the dioxins/furans from behind a cofferdam. This approach minimizes the risk of releases both during the remedy construction phase and over the long-term by removing the mass of contaminants in the system. Leaving the waste in place at the site will continue to be susceptible to damage by future hurricanes and flooding events, as well as changes in stream morphology, and allow the environment to potentially continue to be impacted by waste being released. The implementation of an alternative that removes the waste minimize the potential for future releases and protects the river in the long-term.*

2.5.66 Comment: Does USEPA believe the in-place containment alternative is a viable option for the San Jacinto River waste pit sites?

Response: *EPA does not believe that in-place containment is an effective option for the Site due to the potential for future catastrophic weather events, location on a dynamic river, failures to the cap, and the unpredictable nature that an enhanced cap can maintain structural integrity for the long-term.*

2.5.67 Comment: Does USEPA believe the in-place containment alternative, as implemented throughout the US in similar waterways, is a minimally invasive, reliable, durable, and well-understood remedial alternative?

Response: *Each site has different environmental conditions and constraints. EPA believes that in-place containment is a viable alternative under appropriate environmental and site settings that will support stable remedy conditions that achieves the intended goals and which requires minimal operations and maintenance over the long-term. EPA evaluates each site on an individual basis and not on a one design fits all.*

2.5.69 Comment: Does USEPA disagree with the detailed analysis provided by the US Army Corps of Engineers that the in-place containment alternative would be able to withstand a barge strike with minimal impact to the environment?

Response: *The US Army Corps of Engineers does report that barge strikes can pose the potential for contaminant loss. The predicted contaminant loss is low but EPA is concerned with any loss no matter the size. The US Army Corps of Engineers report is for one barge strike when there is the potential for simultaneous multiple barge strikes based on the number of barges staged upstream in near proximity to the Site. The removal of the waste as identified under Alternative 6N will eliminate the concern of a release associated with a barge strike and will be more protective in the long-term.*

2.5.72 Comment: As documented by the US Army Corps of Engineers, residual dioxin waste will be released during construction of the proposed plan and these residuals will remain in the environment and will be transported downriver into Galveston Bay.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam to control releases during the removal phase. During implementation of the removal alternative, best management practices will be employed to control the potential for release of waste from all operations. The potential for a release will still exist if a cap system is utilized and the damage downstream will be greater than any release during the construction phase.*

2.5.73 Comment: EPA's analysis of the Alternative 6N is incorrect, because the number of bucket passes and the size (used to dredge) of the buckets used in the calculations of the release/resuspension of sediment was wrong, and the number of passes was also incorrect. This is based on the Corps of Engineers use a 10-cubic yard dredge bucket when a 2 to 3.5 cubic yard bucket is more appropriate for the particle size and the ability of vessels to operate in the shallow draft around the impoundments.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and perform excavation in the "dry" to control releases during the removal phase. Comments regarding bucket size and calculations of release/resuspension no longer apply to the selected remedy. The removal alternative is a viable alternative that is implementable. It reduces the volume of material in the environment, it has excellent long-term effectiveness, and it improves the human health and environmental protectiveness.*

2.5.74 Comment: The anticipated schedule appears to be set based upon installation of BMPs as stated in the Proposed Plan, except without considering any of the questions regarding "where feasible," "if practicable," or "as appropriate." If just one of the many variables at the site turns out not to be feasible or practicable, what happens then? Redesign, reorder equipment, get new approvals, and try something else? These take time and effort, and there appears to be no contingency built into the 19 months listed in the Proposed Plan as the construction period.

Response: *Use of a cofferdam for a removal in the "dry" approach is considered to be the most effective engineering control measure to reduce releases and residuals at the San*

Jacinto River Waste Pits. Cofferdams offer flexibility in construction methods and material to accommodate the local site conditions and project goals. Additionally, the cofferdam can be placed outside of the armored cap to prevent disturbance of the contaminated sediment prior to containment. Cofferdams have been constructed in similar locales for excavation and construction activities such as at Formosa Plastics, the Texas site for contaminated sediment removal, at Matagorda Bay for archeological recovery and at numerous coastal sites for construction. Removal in the "dry" was performed to control organic chemical liquid releases in the upper 1½ miles of the Housatonic River site using cofferdams and by-passing the river flows. Cofferdams have been used in a large sediment removal in the "dry" project in the Grand Calumet River in Indiana to control organic chemical liquid releases. The Phase I Removal Action in the Passaic River utilized a sheet pile enclosure with sealed joints for dioxin contaminated sediment removal. Berms have been employed to form cofferdams to control resuspension at Hooker Chemical site in New York. The construction time will be re-assessed during the Remedial Design since construction of the cofferdam and dewatering the site will be more time consuming than implementation of other best management practices. Additionally, the impact of maintaining a dewatered condition and treating water considering precipitation/weather at the site will be evaluated during the design phase. It is commonly recognized that changes to the estimated time can occur due to unexpected conditions or extreme events.

2.5.75 Comment: The expectation that subsequent re-dredging and removal of recently installed clean fill over the excavated or dredged areas has not been considered in the dredging duration. The EPA has not recognized the higher levels of resuspension and residuals that will occur on this site due to the armor cap. Therefore, it has not considered the consequential impacts to schedule due to the re-dredging and additional clean-up efforts.

Response: *Based on comments, EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile to control releases during the removal phase. This will minimize redistribution of contaminated sediment over recently excavated areas.*

2.5.76 Comment: It is clear that EPA does not have an understanding of how Alternative 6N will be accomplished and still meet relevant environmental criteria, such as being protective of human health and the environment and not releasing dioxins/furans into the surrounding area and river. This is a product of the fact that no such remedy (the removal of an existing engineered armor rock cap and underlying waste, adjacent to and in a dynamic riverine environment) has ever been attempted, to our knowledge.

Response: *EPA disagrees with the commenters' assertion regarding Alternative 6N protectiveness of human health and environment and the means to achieve the remedial action objectives. Based on comments, EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile to control releases during the removal phase. Cofferdams have been constructed in similar locales for excavation and construction activities*

2.5.77 Comment: The extent of dredging or excavation in the "dry" behind sheet piles is quite unclear and is based upon those key phrases "where feasible" and "to the extent practical."

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam to control releases during the removal phase. The use of a total enclosure behind a cofferdam greatly increase the ability to meet the remedial action objectives for the Site.*

2.5.78 Comment: Removal in the "dry" will be conducted where feasible or practicable, and EPA hopes that will be in the Western Cell and the shallow water portion of the Eastern Cell. However, EPA does not actually know if dredging behind sheet pile walls in the shallow water portion of the Eastern cell can be accomplished. If it cannot, the estimates of releases of resuspended contaminants and residuals are wrong, and the basis for selection of Alternative 6N is erroneous.

Response: *The selected remedy includes removal in the "dry" behind a cofferdam and sheetpile wall. The approach reduces the complexity of staging and phasing of best management practice controls, cap removal, waste removal, and residuals management in an incremental manner throughout the site and reduces the need for precision construction for residuals management. Quality assurance/quality control, performance goals, or consistency with standards are topics to be addressed in the Remedial Design and work plan. These topics are standard components of all remediation projects. Acceptance criteria will be established target depth, residuals management, emissions, effluent quality, production, water management, containment, site closure, and other items. EPA disagrees with the commenter's conclusion that the basis of selecting Alternative 6N is erroneous. The selection process consists of an evaluation and balancing of nine CERCLA criteria which include overall protectiveness of human health and the environment, compliance with ARARs, long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, short-term effectiveness, implementability, cost, and state and community acceptance.*

2.5.79 Comment: The US Army Corps of Engineers presumes that removal in the "dry" will release almost nothing to the river environment in the way of contaminants. This may be true for some remediation sites, but it is just plain incorrect for this site, given its characteristics.

Response: *Removal by dredging does result in resuspension and release of material. However, EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile, and perform excavation in the "dry" to control and minimize releases during the removal phase.*

2.5.80 Comment: The issue is which BMPs are to be used and where will they be placed? This is a complex site, and different BMPs would be appropriate in given areas of the site. Each must be evaluated separately to determine feasibility. Simply making lists of potential BMPs in both the US Army Corps of Engineers' report and EPA's Proposed Plan does not constitute a proper evaluation of the actual steps to be taken; thus an accurate estimate of implementability, risk, release, and cost is not possible.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile with excavation in the "dry" to control and minimize releases during the removal phase. Additional best management practices will be included as necessary to control various steps in the construction, treatment, handling, and transportation processes. These are issues that will be addressed in the design phase. EPA disagrees that an accurate assessment is not possible. The design is the appropriate place to develop the necessary best management practices either individually or in combination to achieve the required outcome and minimize contaminant releases.*

2.5.82 Comment: EPA has not demonstrated an understanding of the technical challenges (e.g., underwater removal of the rock, how to cut the geotextile, how to pick it up without creating a dispersion of residuals, how to remove the cap and geotextile in small sections, and how to peel back the rock and geotextile to install sheet pile) nor evaluated the environmental ramifications associated with the actual removal of the cap, geotextile and waste.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam to control releases during the removal phase. Construction steps included in the comment are detailed elements that are included in the Remedial Design and specifications.*

2.5.84 Comment: EPA's identification of BMPs constructed to elevation 5 feet NAVD88 appears to be protective of storms with less than a 10-year return interval. BMPs constructed to elevation 10 feet NAVD88 might only be protective of a 25-year storm, which is inconsistent with EPA's statement that BMPs would provide protection from a 25- or 50-year return interval storm (Proposed Plan, p. 35). Given these inconsistencies, EPA could not possibly have prepared an accurate evaluation of the impact of storms during construction of Alternative 6N.

Response: *Establishing the top elevation for sheet pile walls/cofferdams is most appropriately left for the design phase. However, for costing purposes, the cofferdam and sheet piles were estimated to be set at an elevation equivalent to the 100-year flood, or 14-feet above sea level.*

2.5.86 Comment: Removal of the TCRA cap is unprecedented, world-wide. The TCRA cap was designed and installed to isolate the waste materials in the waste pits. EPA guidance on installation of interim measures like the TCRA cap requires that such measures be consistent with the final remedy. The cap was not designed to be removed; it was designed with EPA approval in accordance with engineering practices that would isolate the wastes from the river environment and withstand 100 year storms. There is no experience from which to draw regarding the removal and the attendant generation and release of resuspended contaminants.

Response: *The TCRA cap was considered and identified as a temporary measure to provide protectiveness until a final remedial action could be completed. Storm events less than the 100-year floods are affecting the stability of the existing temporary cap. Based on the historical maintenance requirements and other considerations, EPA believes removal is the best approach to achieve the remedial action objectives. The use of a cofferdam and sheetpile wall*

with excavation in the "dry" will effectively control and minimize the release of contaminants during the removal activities.

2.5.87 Comment: The predictive models used by the US Army Corps of Engineers are based upon empirical data about conventional excavation activities. In this case, the removal of an engineered armor cap consisting of rock and geotextile from impacted sediments has never been attempted, which means that there is no experience for estimating the resulting resuspension, residuals, and collateral contamination.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile wall to control and minimize releases during the removal phase. The evaluation contained in the US Army Corps of Engineers report provides the best science and logic available to date. While some of the assumptions may differ from actual conditions, it provides a reasonable estimate of the expectations.*

2.5.88 Comment: EPA fails to adequately address the releases associated with all the sub-phases of this removal effort, including site preparation, mobilization of people and equipment, potential releases from storms, and the continual decontamination efforts on and around the site. More importantly, removal in the wet involving dredging wholly mischaracterizes the significant releases and expansion of the contamination footprint around the site by exposing the currently contained waste protected by the armor cap.

Response: *EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and sheetpile wall with excavation in the "dry" to control and minimize releases during the removal phase. This will effectively control releases of contaminants to the San Jacinto River. Excavation activities, operations, and treatment are well known.*

2.5.90 Comment: It is not made clear in the Final Interim Feasibility Study or Proposed Plan whether the target is stability against an event with a 500-year return interval or against multiple events that might occur during that period.

Response: *Achieving protection of human health and the environment requires that a capping remedy be able to reliably contain the wastes under the site conditions for as long as necessary to provide the required protectiveness. That was assessed through the simulation of a Category 2 hurricane and the 1994 flood. This resulted in a flow that was somewhat larger (at 390,000 cubic feet per second) than the 1994 flood (360,000 cubic feet per second), which was approximately equal to a 100-year flood. Category 4 or 5 hurricanes can possibly occur with their associated more intense wind, storm surge, and wind driven waves. However, attempting simulate these storms would add another layer of uncertainty to the results because there is no actual storm data for these hurricanes in the area.*

2.5.91 Comment: Most structures, even those designed for protection of life and property, such as dams and levees, are not designed to withstand a 500-year event. We cannot and do not design projects such as flood control levees or dams or coastal protection features against such events;

therefore, selecting a remedy approach or designing a remedy for CERCLA on such a basis is inequitable and technically inappropriate in my view.

Response: *A capping remedy should be able to reliably contain the toxic waste material. If not, capping would not be appropriate for a Superfund site. According to the US Army Corps of Engineers, the modelled flood and Category 2 hurricane was close to the 100-year flood with the additional impact of hurricane driven waves. It is appropriate to consider these conditions given the location of the Site in assessing the long term reliability of a cap. In fact, even more intense Category 4 or 5 hurricanes can possibly occur with their associated storm surge and wind driven waves. However, attempting to simulate these storms would add another layer of uncertainty to the results because there is no actual storm data for these hurricanes in the area.*

2.5.93 Comment: The US Army Corps of Engineers Report does not include mention of any modeling done for the Alternative 3aN Enhanced Cap. Since the real decision on the preferred remedy is Alternative 3aN versus Alternative 6N, it is very puzzling that EPA did not choose to model the Enhanced Cap for Alternative 3aN.

Response: *Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.5.97 Comment: Another aspect of releases from the Site is an issue of odor from the exposed waste during the removal operations. There is no mention of this issue in either the Final Interim Feasibility Study or Proposed Plan.

Response: *There are a number of techniques that are used to control fugitive emissions from contaminated sites. These items along with other best management practices will be fully explored, assessed, and included in the design plans as necessary.*

2.5.98 Comment: EPA states that the goal is "dry" excavation to the extent possible, with dredging as required. But dewatering will be difficult since the excavation will extend approximately 5 to 10 feet below the water table. Drying an exposed surface of fine grained material takes months at best, and then the drying does not extend to depth. So, in areas with high water content, the excavation will be a slow and sloppy operation even if done "in the dry."

Response: *The dewatering system will be developed during the design phase, however, it is expected to include a sump excavated along the edge below the depth of contamination to collect runoff, seepage and drainage, and improve dewatering. The sump would be pumped*

down as needed to maintain a dewatered site. All of the water pumped from the Site, including site water, storm water, wash water and seepage, would be treated prior to discharge at the Site.

Excavation in the "dry" refers to removal in an unflooded state. The best management practice being proposed is a cofferdam with sealed joints and filled with low permeability soil to control seepage through the cofferdam. The foundation soils include at least 10 feet of low permeability soft silt and clay immediately below the waste layer and underlain by a sand layer of similar thickness. The sand layer is underlain by more than 25 ft of hard, dense Beaumont clay. The cofferdam would be anchored in the Beaumont clay layer and would cut off the sand layer and limit the potential seepage. Upwelling through the clay layer is expected to be slow.

The majority of the waste is expected to be soft and saturated. Construction activities on saturated sediments is also commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River Waste Pits.

2.5.99 Comment: The approach of incremental removal and capping is in conflict with US Army Corps of Engineers recommendations. The US Army Corps of Engineers Report states: "The entire cap within the sheet pile enclosure should be removed prior to solidification, excavation or dredging to limit contamination of the TCRA armor cap material." (US Army Corps of Engineers Report, p. 118). The point made by the US Army Corps of Engineers with this statement relates to the difficulty in excavating a portion of the waste material without tracking over clean capped areas to transport the excavated material out of the work area. Also, the incremental excavation of sub-areas requires excavation to depth and placement of the residuals cap while still maintaining the surrounding areas without slumping and deeper slope failures.

Response: *Consideration of the complexity, controls and uncertainty of the efficacy of the remedy using commonly used removal approaches and BMPs has led to the decision that removal would be best performed in the "dry" within a cofferdam. The approach reduces the complexity of staging and phasing of BMP controls, cap removal, waste removal and residuals management in an incremental manner throughout the site and reduces the need for precision construction for residuals management.*

2.5.101 Comment: EPA did not provide an accurate description of stability of jetties and breakwaters in the context of evaluations of Alternative 3aN cap armor. EPA presents a partial quote from the US Army Corps of Engineers Report in the Proposed Plan: "There appears to be no documented cases of any armored cap or armored confined disposal facility breaches. However, there have been many occurrences of breaches and slope failures of armored dikes, jetties, and breakwaters, with some of those structures confining dredged material." (Proposed Plan, p. 8, quoting US Army Corps of Engineers Report, p. 82). However, EPA conveniently fails to provide the second part of the same statement from the US Army Corps of Engineers Report which states: "None of the listed cases completely breached or failed and were discovered by routine inspections. Repairs and rehabilitation measures, when documented, were easily made." (US Army Corps of Engineers Report, p. 82). This is a classic example of taking a

statement out of context, to skew the message. This tactic of presenting partial information in an unbalanced fashion is clearly an example of inequitable comparison of alternatives.

Response: *The message is that breaches occur. A breach of the cap may result in the release of a hazardous substance, while a breach of a dike will not. Dikes, jetties, and breakwaters are all easily observed from the land and potential failures are more easily observed and recognized than existing or impending failures to a subaqueous cap. The fact that the dikes can be repaired, as can a cap, does not address the issues associated with a release of a hazardous substance.*

2.5.102 Comment: What is the potential for catastrophic loss of contamination at the site during construction due to bank failure and/or severe storm events and associated flooding during excavation of the waste pits?

Response: *The potential for a loss of waste material will be minimized using best management practices. The potential applications are described below, however, the actual approach will be developed during the design phase.*

The site will remain covered with the armored cap until the cofferdam encircling the site is completed, maintaining the current level of protection at the site. The height of the sheet pile walls is a design decision that will require further evaluation. The proposed elevation of 10 ft NAVD 88 was based on modeled elevations presented in the Feasibility Study for a design flood with a 25- to 50-year return period. Actual flood elevations at the northern San Jacinto waste pits are uncertain and require more study and modeling. For costing purposes, the cofferdam top height was set at 14-feet above sea level, or 2-feet above the 100-year flood elevation to allow for wave protection. The intent of the proposed cofferdam elevation is to reduce the probability and frequency of inundation, limit the scour potential if inundated, reduce the potential volume of water to be treated from multiple dewatering events, and restrict the size of delays in production.

The armored cap would be incrementally removed as the waste material is excavated to depth. The armored cap above a small section of the site along the northern edge would be removed first and then then entire depth of waste material in that small section would be removed next. The excavation would then proceed in an adjacent section using the same approach. The size of the section would be dependent on the reach of the equipment and the slumping of the waste materials. As such, only a small sloped face of contaminated material would be exposed at any time, limiting the potential contaminant releases. Removal operations would be stopped during hurricanes and flooding and would not resume until flooding has receded and the site has been dewatered. If the site is inundated by flooding, whether associated with a hurricane or not, the height of the proposed cofferdam and the short fetch length within the cofferdam would reduce flows and waves across the site and consequently the resulting bottom shear stress. The resulting shear stress would be too small to erode the remaining armored cap or residuals from the depths post-excavation.

2.5.104 Comment: The US Army Corps of Engineers concluded that removing the existing armored cap and excavating the capped waste would inevitably result in significant releases of

dioxins to the environment. The US Army Corps of Engineers detailed the hazards of taking the unprecedented action to remove an armored cap and the technical challenges of "excavating in the dry," as called for by the new alternative the US Army Corps of Engineers was directed by Region 6 to develop.

Response: *They Corps of Engineers and EPA agree with the comment when removal is performed in the wet where water is able to be transported through the Site as with dredging. To eliminate material contaminant releases and residuals associated with removal operations, the removal would need to be performed in the "dry" by dewatering the site. Consequently, the BMPs for the site would need to include a double-walled cofferdam surrounding the Site. The cofferdam may consist of a ringed structure constructed with two walls of sheet piles with sealed joints driven into a low permeability foundation layer and filled with soil to limit seepage. Portions of the sediment at the base of the cofferdam would be armored to prevent erosion at the base of the outer wall. Additionally, the cofferdam must be of sufficient height to prevent overtopping from most flooding events. All of the water pumped from the site, including site water, storm water, wash water and seepage, would be treated prior to discharge at the site. Removal in the "dry" eliminates the potential for resuspension and release of contaminants and contaminated water. It also prevents the formation of residuals from sedimentation and allows removal to "clean" by preventing the fluidization and spreading of the sediment in an uncontrolled manner. Additionally, removal in the "dry" facilitates the sampling, monitoring and testing of the site to ensure compliance.*

2.5.106 Comment: For Alternative 6N, Region 6's Final Interim Feasibility Study does not address constructability and the many challenges to "removal in the dry" articulated by the US Army Corps of Engineers. Failure to address this means that selection of Alternative 6N based on the Final Interim Feasibility Study and the current Administrative Record would be arbitrary and capricious.

Response: *The EPA and US Army Corps of Engineers are aware of these challenges associated with the constructability of Alternative 6N. These challenges are not addressed in the Proposed Plan because these details will be addressed during the remedial design. A cofferdam is proposed as the best management practice for implementing excavation in the "dry". The components of the selected remedy (Alternative 6N) have been implemented at numerous sites and are therefore considered to be technically feasible. The cofferdam would be placed outside and surrounding the existing armored cap so as not to disturb, resuspend and release contaminated sediment during construction of the cofferdam nor complicate and interfere with armored cap removal.*

2.5.107 Comment: The Proposed Plan's unprecedented and inappropriate proposal to completely remove an existing engineered cap that was constructed with U.S. EPA approval under the CERCLA Time Critical Removal Program, despite the fact that it has been proven effective in containing the existing waste and contaminated sediment, would undermine one of the key, well-accepted Superfund remediation tools -- capping. We are not aware of any precedent for the removal of an installed engineered cap. Such a decision would set a terrible precedent, which could have serious repercussions at many other sites nationally, not the least of which would be at least two "mega sites," the Lower Passaic River and the Willamette River.

Response: *The EPA does not consider the exposure of dioxin contaminated waste as occurred in 2015 as proving the effectiveness of capping for the Site. Capping under the correct environmental setting is an appropriate technology for isolation of contaminated sediments. However, based on the historical performance, the location on the San Jacinto River requires repeated maintenance to maintain the cap integrity and long-term effectiveness desired to achieve the remedial action objectives. Each site has different environmental conditions and constraints. EPA evaluates each site on an individual basis and not on a one design fits all. For the Site, one reason for performing the selected remedy is to prevent a large contaminated sediment site similar to some other sediment sites.*

2.5.108 Comment: Among other things, potentially responsible parties will be less likely to participate in time critical removal actions or other interim remedies when there is so little assurance that the work performed (and costs incurred) will be consistent with the final cleanup plan. In addition, requiring the removal of this cap, at a substantial additional expense, will trade a working remedy that has been demonstrated to be effectively controlling the risk, for a removal remedy that the Army Corps has confirmed will result in unavoidable releases of contaminants during its construction. This trade-off is not acceptable, nor is it consistent with CERCLA's nine remedy selection criteria, or the NCP.

Response: *The purpose of the time critical removal action was to temporarily stabilize the Site by designing and constructing a physical protective barrier until the Site is fully characterized and a remedy is selected. This removal action was necessary to address an imminent and substantial endangerment to public health and the environment. Every site is unique, and the conditions at the San Jacinto River Waste Pits Site are not supportive for achieving long-term protectiveness with a capping remedy. The EPA does not consider the exposure of dioxin contaminated waste as occurred in 2015, nor the need for repeated maintenance, as demonstrating the effectiveness of capping for the Site. The original cap was a temporary measure until the final remedy could be selected; there was no agreement that suggested the measure would be permanent. Regarding unavoidable releases during removal, the EPA has selected a final remedy that completely encircles the capped area with a cofferdam and sheetpile wall with excavation in the "dry" to prevent the typical releases that occur during dredging. There is no trade off on risk; the selected remedy will effectively control the short-term risks as well prevent long-term risks, unlike the capping alternatives, because the waste will not be present at the Site.*

2.5.109 Comment: The standard U.S. EPA Region 6 is using to reject retaining the existing cap – that there must be virtually complete certainty about the permanent integrity of the cap – establishes an unrealistic and unachievable standard for risk-based cleanup decisions to meet. In fact, based on the Army Corps Report, the ONLY certainty is that removal of the existing cap and underlying waste will result in some releases, and that there is a likelihood that significant releases of dioxin could occur based on historical heavy rain frequency and major storm events. Not only is this inconsistent with the approach applied by all U.S. EPA Regions at all other contaminated sediment sites, this standard will amount to a de facto mandate for complete sediment removal at all contaminated sediment sites– a result that would be disastrous for the many sites, including the San Jacinto River Waste Pits, where the environment and the local

community can be better protected from risk by enhancing the existing engineered and installed cap.

Response: *Regarding certainty, EPA does not have a requirement for a "complete certainty" to evaluate capping effectiveness; instead capping, or any remedial action, must provide long-term protectiveness. However, the current cap's history, the future exposure to repeated hurricanes, and the U.S. Corps of Engineers model results for an upgraded cap do not demonstrate that capping could provide acceptable long-term protectiveness. The need to contain the waste over a long term to realize protectiveness, and the questionable performance of the existing cap do not provide assurance that a capping remedy would be successful over the long-term. The demonstrated river morphology history and future storms were factors introducing substantial uncertainty for the long-term effectiveness of a capping remedy. Each site has different environmental conditions and constraints. EPA evaluates each site on an individual basis and not on a one design fits all. EPA believes the selected remedy, Alternative 6N, will be the best approach for the Site considering the CERCLA remedy selection criteria. EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam and perform the removal in the "dry" to prevent material releases during the removal phase. The selected remedy, by removing the wastes, will remove the potential for future release, which would always be present for a capping remedy located in the San Jacinto River.*

2.5.110 Comment: The dredging and removal of some 150,000 cubic yards of material will overwhelm the available construction infrastructure. There is only a single roadway to access the Northern Impoundments and that this roadway can become flooded during high water. Therefore, it appears that some additional surface access will have to be constructed, along with obtaining the necessary right(s)-of-way. In addition, off-site transportation facilities will need to be built to accommodate the Proposed Plan. These implementability issues have not been adequately evaluated in the Proposed Plan.

Response: *Transportation access is a common issue for all Superfund sediment removal projects. Access to I-10 is only about 1½ miles from the site via the East Freeway Service Road, which is primarily used for non-residential, commercial/industrial traffic and trucking. The number of trips per day depends of the size of the trucks used. If small trucks are used for disposal, the maximum round trips per day would be about 200, including disposal trucks, deliveries and workers. For a 12-hour work day, it would be a vehicle about every four minutes. If 20 cubic yard trucks were used, there would be one truck every 10 to 15 minutes, or about one vehicle every six minutes including worker traffic and deliveries. There is little other traffic over most of the route. The traffic volume is inconsequential for I-10 and its ramps, representing about 0.1 percent of the average daily traffic on I-10 and less than three percent of the ramp capacity. Consequently, it is unlikely that additional surface access would need to be constructed; however, the access may need to be improved to provide relief from flooding potential. Transportation of the removed material and implementation will be determined as a part of the Remedial Design. If transport is performed by trucks, some road improvements and repair will probably need to be considered in the Remedial Design. Details for the transportation issue identified in the comment are details that will be covered in the design phase.*

2.5.112 Comment: It must also be recognized that even under the proposed removal action, some contaminated material will remain in place and secured by an engineered cap. Regardless of the target concentration of contaminated material that will remain, given EPA's dismissal of the enhanced cap endorsed by the COE, a detailed justification of how the remaining wastes will be secured under EPA's pessimistic assumptions of cap performance in the future should be part of any risk assessment of the proposal. The fact that waste will remain on site also presumes that the responsible parties will maintain an ongoing obligation to ensure the security and performance of whatever cap in in place. But to directly address EPA's concerns about long-term security of the enhanced cap, that obligation on the part of the responsible parties will exist just as effectively if all of the waste is secured on site.

Response: *EPA is lowering the remediation goal to 30 ng/kg. EPA is also modifying the preferred alternative to include completely encircling the capped area with a cofferdam for removal in the "dry". This approach eliminates the dioxin release that is generated during underwater dredging because dredging will not be performed. This supports attainment of the Remedial Action Objectives. An enhanced cap will not remove the Principal Threat Waste from the system. An enhanced cap will, at least initially, reduce the mobility of the wastes. However, over the long term with the potential for significant cap damage as a result of hurricanes, the long term mobility reduction is not likely to remain. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.5.113 Comment: EPA states in the Proposed Plan that approximately 13,300 truck trips may be required to transport the waste material to the off-site approved permitted facility; however, capacity of roads to handle the loads will impact the truck size that can be used. The method of transportation and number of trips will be determined during the Remedial Design, as well as other transportation alternatives, including rail transport. The material will require dewatering by removal and/or treatment so that there are no free liquids. San Jacinto River Fleet is close enough to the Site to provide a convenient staging area for offloading freshly excavated material without having to haul it over public highways. Additionally, San Jacinto River Fleet has sufficient space available on their property to handle any capacity of dewatering operation developed by EPA. To this end, San Jacinto River Fleet is willing to lease land to EPA for stockpiling and dewatering operations, with the condition that no impact to the San Jacinto River Fleet property remain after Site cleanup is complete. Further, San Jacinto River Fleet would be willing to provide input in developing procedures for dewatering and materials handling.

Response: *The site stakeholders appreciate the option of using the San Jacinto River Fleet property to support the site remediation. Transportation of the removed material will be determined as a part of the Remedial Design. As noted in the Proposed Plan, approximately 13,300 truck trips may be required to transport the waste material to the off-site approved*

permitted facility. However, the capacity of roads to handle the loads will impact the truck size that can be used and therefore the number of trips required. Barge transport may be a viable option and use of the San Jacinto River Fleet property would facilitate that option. Multiple options also exist for staging, stockpiling and dewatering that will be evaluated and selected during the Remedial Design. If transport is performed by trucks, some road improvements and repair may need to be considered in the Remedial Design.

2.5.114 Comment: In addressing the dilemma on how to protect the post closure cap without berms, San Jacinto River Fleet proposes an alternative solution that will eliminate the need for the post closure cap and berms. Presumably the reason for the cap and berms in post closure care is to protect soil that will be left in place with dioxin concentrations up to 200 ng/kg. Also, the presumable reason for leaving dioxins in place at 200 ng/kg or less is the added expense of removal and transport under a clean closure scenario. As an alternative to trucking contaminated soil to the disposal facility, San Jacinto River Fleet is offering to provide barges as an inexpensive means to transport the impacted soil to a location as close to the waste disposal facility as possible and then truck it the rest of the way. The cost savings for this scenario may be sufficient to pursue a clean closure of the Site so that the post closure cap and berms are not required. The Site could then be delisted and become part of the navigable waters of the San Jacinto River.

Response: *EPA is lowering the target concentration to 30 ng/kg for the waste pits to pursue a closure of the site without the need for a residuals cap and berms. A cofferdam and sheetpile wall will be used to totally encircle the capped area and sediment will be removed in the "dry". A variety of transportation options including barge transport will be considered during Remedial Design of the transportation and disposal components using a number of factors including costs, feasibility and implementability. EPA appreciates the offer of assistance from the surrounding communities and businesses. However, the final method of transportation and disposition will be identified in the Remedial Design phase.*

2.5.115 Comment: The EPA states on page 32 of the Proposed Plan that permits are not required for on-site CERCLA actions. This, then, is followed up with a commitment to use the Clean Water Act as Applicable or Relevant and Appropriate Requirements (ARAR) in order to "avoid, minimize, and mitigate adverse effects on the waters of the U.S. and, where possible, select a practicable ... alternative with the least adverse effects". In this context, San Jacinto River Fleet, as the immediate neighbor, requests that they be apprised of any and all actions that could impede or affect their daily operations. To accomplish this with minimal interference to both parties, San Jacinto River Fleet proposes the following: (1) Afford San Jacinto River Fleet the opportunity to provide input to the remedial design so that EPA's Site remedial operations can be coordinated with fleet operations; (2) Assign point-of-contact personnel for EPA and San Jacinto River Fleet to avoid miscommunication and unexpected work events that affects either's operations.

Response: *EPA will provide public notices and updates to all interested parties throughout the design and construction of the selected alternatives.*

2.**5.116 Comment:** As per the Proposed Plan, Alternative 6N will be a sizable undertaking entailing the removal and processing of over 150,000 cubic yards of material over a period exceeding a year and a half - assuming remediation progresses as scheduled. Unforeseen delays such pre- and post-storm mitigation efforts, equipment failures, or extended ramp-up times in streamlining dewatering and materials handling procedures or failures on the downstream end such as insufficient trucking capacity or Treatment/Storage/Disposal facility capacity could extend the time line to well over two years. As the immediate neighbor, San Jacinto River Fleet would like to have a managerial voice in on-site remedial design and implementation. This could greatly benefit EPA in that San Jacinto River Fleet would be serving as an ally for resolving logistical obstacles to Site remediation that may also interfere with San Jacinto River Fleet operations.

Response: *During the design phase, EPA will review the requirements for treating, handling, temporary storage, and transporting the contaminated material. This will include all possible options to minimize potential problems that could occur from on-site operations as well as improve site logistics. EPA appreciates the offer made by the San Jacinto River Fleet, however, EPA will maintain overall management of the site. EPA will provide public notices and updates to all interested parties throughout the design and construction of the selected alternatives.*

2.5.117 Comment: EPA states on page 35 that the sheet pile walls are currently planned at no higher than 10' NAVD 88 and no lower than 5' NAV088. Is EPA's object here to totally prevent flood waters from inundating the Site or to just minimize scour potential from unabated flood currents? In the two most recent floods (May and June, 2016), San Jacinto River Fleet personnel observed water at the 12 ft mark on the flood gauge. San Jacinto River Fleet has little confidence in the long-term viability of sheet piles or caissons.

Response: *The height of the sheet pile walls/cofferdams is a design decision that will require further evaluation. The proposed elevation of 10 feet NAVD 88 was based on modeled elevations presented in the Feasibility Study for a design flood with a 25- to 50-year return period. Actual flood elevations at the northern San Jacinto waste pits are uncertain and require more evaluation. For cost estimation purposes, the top elevation of the cofferdam was 14 ft NAVD89 to prevent inundation by a 100-year or smaller flood, with a flood stage at the Site for a 100-year flood at approximately 12 ft NAVD89. The intent of the proposed cofferdam elevation is to reduce the probability and frequency of inundation, limit the scour potential if inundated, reduce the potential volume of water to be treated from dewatering of the site, and restrict the size of delays in production. The height of the proposed cofferdam would be greater than the proposed sheet pile wall presented in the US Army Corps of Engineers evaluation report (2016) since all of the removal would now be performed in the "dry" with a cofferdam.*

2.5.118 Comment: EPA indicates on page 29 of the Proposed Plan that approximately 13,300 truck trips may be required to transport the waste material to the off-site disposal facility. This is followed up with the caveat that road capacity will impact the truck size that can be used. San Jacinto River Fleet knows from experience that the I-10 feeder roadway is currently in poor condition and becomes partially covered by extreme high tide events. Barring other transportation alternatives, does EPA have any plans to work with TXDOT in making

improvements to the I-10 right-of-way feeder that will accommodate the high traffic volume and alleviate delays due to high water events?

Response: *Access to I-10 is only about 1½ miles from the site via the East Freeway Service Road, which is primarily used for non-residential, commercial/industrial traffic and trucking. The number of trips per day depends of the size of the trucks used. If small trucks are used for disposal, the maximum round trips per day would be about 200, including disposal trucks, deliveries and workers. For a 12-hour work day, it would be a vehicle about every four minutes. If 20 cubic yard trucks were used, there would be one truck every 10 to 15 minutes, or about one vehicle every six minutes including worker traffic and deliveries. There is little other traffic over most of the route except for the San Jacinto River Fleet traffic. The access may need to be improved to provide relief from flooding potential from high flows and extreme high tides. Superfund projects commonly include road repairs due to site traffic but seldom include road improvements such as raising the road or providing drainage. Stakeholders will need to meet with the Texas Department of Transportation to discuss road improvement and repair issues. Discussions regarding transportation of the removed material and implementation will be determined as a part of the Remedial Design. If transport is performed by trucks, some road improvements and repair will probably need to be considered in the Remedial Design.*

2.5.119 Comment: The original Time Critical Removal Action cap was enhanced in January 2014 in response to an evaluation of the cap's design and construction by Dr. Paul Schroeder, one of the leading experts on in-situ caps and one of the principal authors of the US Army Corps of Engineers 2016 Report.

Response: *There have been continuing problems with the temporary cap and the waste material is considered a principal threat waste representing a source area. EPA acknowledges that capping is a suitable remedy in many environmental settings. However, there are multiple riverine forces which are affecting the cap integrity and stability and ultimately the long-term effectiveness at this San Jacinto site. Although the referenced cap enhancements were made as recommended by the USACE, those recommendations did not have the benefit of an in-depth model simulation study. Based on the model simulations performed by the USACE, the 2014 enhanced cap was projected to suffer significant cap erosion over 80% of its area. In addition, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.5.120 Comment: In December 2015, an EPA Dive Team inspection identified areas in the Western Cell of the cap that were the subject of the US Army Corps of Engineers Cap Report. The US Army Corps of Engineers Cap Report concluded that these areas were associated with construction defects rather than erosion post-construction. No evidence of a barge strike was

noted and the presence of deposition in the area of defects indicated "the long-term presence of the defect, the stability of the sediment at the defect, and no significant release of contaminants from the deficient area."

Response: *A shallow underwater area was discovered by the EPA Dive Team in late 2015 where the armor cap material was missing. The US Army Corps of Engineers reviewed that data and found that the area of missing rock was most probably associated with the construction of the cap. Further, the US Army Corps of Engineers reported that ground surveys showed subsidence over time in the deficient rock area and concluded that the defect was caused by the sinking of the cap over time into the underlying waste material due to either an improper filter/support layer under the rock cap or unusual decomposition of organic matter under the area. Sampling of the waste material found dioxin present at a concentration of over 40,000 ng/kg that was exposed to the San Jacinto River. The amount of time that this dioxin was exposed to the river is unknown. Repairs of the area were completed in early 2016 with the placement of geotextile covered by armor rock material.*

2.5.121 Comment: The evaluation of the current cap showed that there were localized areas where the armor rock thickness did not meet design standards. These areas do not appear to be the result of ongoing cap disturbance and degradation but were most likely associated with cap construction and post-construction settling issues.

Response: *The long-term river bed stability is an issue of concern. There have been instances of changes in river morphology over time due to a variety of events. While the cap itself may be repaired, there is concern regarding the stability of the adjacent channel sediments.*

2.5.122 Comment: There is no evidence that the current cap integrity is changing significantly with time, or that a cap of the type constructed would ultimately fail.

Response: *Capping technology is considered an acceptable remedy in the correct environmental setting. Based on the historical performance it appears that the San Jacinto River forces which are demonstrated in the aerial photographs offer significant challenges to the long-term effectiveness of maintaining a stable cap.*

2.5.123 Comment: The 2007 National Academies study of the effectiveness of environmental dredging was unable to conclude that dredging alone could achieve long-term risk reduction due primarily to the inability to fully remove contaminants and avoid sediment resuspension or residual contamination.

Response: *The findings of the 2007 National Academies study of the effectiveness of environmental dredging reflects the performance of environmental dredging in the "wet", often with limited best management practices, without residuals management, and with a goal of mass removal rather than immediate achievement of risk reduction. In recognition of the difficulty in achieving risk reduction by environmental dredging, the selected remedy in the Record of Decision includes a cofferdam and sheetpile wall to completely enclose the capped area for removal in the "dry" by excavation rather than "wet" dredging. Excavation in the "dry" will*

facilitate monitoring, testing and sampling of the final surface to achieve long-term risk reduction.

2.5.124 Comment: Often risk reduction after dredging is achieved with residuals management, for example, placement of a post-dredging cap or backfill layer. Such a residuals management layer, however, is not normally designed for stability under even modest flow conditions and is unlikely to remain in place under conditions for which the caps under Alternative 3N or 3aN are designed. Alternative 6N requires installation of a sand and armored cap to contain residuals following removal operations, so the same monitoring, maintenance and potential release mechanisms will exist for both alternatives, although it is difficult to envision that the residual containment would be designed to the same degree of protectiveness as the Alternative 3aN cap.

Response: *EPA is lowering the remediation goal to 30 ng/kg and utilizing a cofferdam and sheetpile wall around the waste pits with excavation in the "dry" to minimize the residual risk associated with the remedy. This is one of the principal reasons that the technique selected for removal is excavation in the "dry" enclosed within a cofferdam instead of dredging. Excavation prevents the formation of residuals from sedimentation and allows removal to the cleanup level by preventing the fluidization and spreading of the sediment in an uncontrolled manner. Additionally, excavation in the "dry" facilitates meeting the target depth of removal, permitting visual inspection of residuals, which may be evident by differences in color, texture and consistency. Removal in the "dry" facilitates the sampling, monitoring and testing of the site to ensure compliance since the residuals are not mobile on a dewatered site. Residuals transported by runoff would be collected in the drainage sump and removed before site closure. The target concentration for residuals will be decreased to 30 ng/kg to pursue a closure of the site without the need for a residuals cover. In practice, the dioxin concentration remaining in the sediment after removal is likely to be much lower since excess material will be removed below the target depth to ensure that the target is met.*

2.5.125 Comment: The releases and residuals from the Alternative 6N cannot be predicted with the precision implied by the US Army Corps of Engineers 2016 Report and they could potentially be much greater. As noted in the US Army Corps of Engineers 2016 Report, for example, potential releases and implementation issues will be exacerbated during storm events that will occur during the construction period.

Response: *The predictions are meant to be characteristic of the proposed operations and suitable for comparing operations or approaches and technologies. Actual releases and residuals would be a function of the actual design, equipment, scheduling, operation, site conditions and weather. To eliminate the effects of these variables, the removal will be performed in the "dry" by dewatering the site. The Remedial Design will consider these variables when scheduling and sequencing operations.*

2.5.126 Comment: Conducting the removal remedy in stages can reduce the impact of small storm events but would be unlikely to provide significant control of resuspension and residuals if a major storm event were to occur during construction.

Response: *The comment is based on removal in the wet without complete containment where water is able to be transported through the site. To eliminate this potential exposure during removal operations, the removal will be performed in the "dry" by dewatering the site. The cofferdam would be constructed to contain the site before cap removal and sediment excavation. Runoff from both small and major storm events would be collected along with seepage in a sump within the cofferdam and then pumped to a water treatment plant. Solids collected in the sump would be excavated prior to completion. The cofferdam would be constructed to prevent inundation except for major flood events. With containment by a cofferdam, removal would not need to be performed in sections to restrict resuspension and residual, however, only a small portion of the cap will be removed at any one time to access the underlying waste. Removal in the "dry" eliminates the potential for resuspension and release of contaminants and contaminated water. It also prevents the formation of residuals from sedimentation and allows removal to the cleanup level by preventing the fluidization and spreading of the sediment in an uncontrolled manner. Additionally, removal in the "dry" facilitates the sampling, monitoring and testing of the Site to ensure compliance.*

2.5.127 Comment: The Proposed Plan suggests that there may be negative consequences of the additional rock placement including settling or expression of waste material beyond the cap. Settling of the current cap has not led to observable negative consequences and has likely led to some consolidation and strengthening of the underlying waste material. The expression of waste material beyond the cap is highly unlikely given the observed need for gentle slopes on armoring material that will extend the cap far beyond the boundaries of the waste.

Response: *The EPA notes that the area of missing cap found by the EPA Dive Team in 2015 was caused by the armor cap sinking into the waste material and resulted in exposing dioxin at over 40,000 ng.kg to the San Jacinto River. There is also the possibility that additional loads on the capped area may result in further sinking or movement of the underlying materials.*

2.5.128 Comment: An additional concern expressed by EPA regarding Alternative 3aN is the failure to treat Principal Threat Waste exhibiting dioxin concentration greater than 300 ng/kg (although the preferred remedy also provides no treatment of the Principal Threat Waste). EPA considers material at the Site to be Principal Threat Waste due to its toxicity and potential mobility. Mobility of the waste materials should not be of concern for Alternative 3aN since it was designed to protect against even very low probability events now and in the future. The use of an armoring rock with a median diameter of 15-inches exceeds the US Army Corps of Engineers suggested 12-inch which would be expected to be protective under the hypothetical event of maximum river discharge and a simultaneous storm surge similar to that observed with Hurricane Ike.

Response: *Capping poses concerns with long-term effectiveness/permanence from disruption from barge strikes, erosion, and channel realignment. The US Army Corps of Engineers believes that the hydrodynamic and sediment transport modeling was sufficient to establish concerns regarding the site stability. Demonstration of shear stresses sufficient to erode larger than 8-inch stone as shown in the modeling was sufficient to indicate potential for channel migration to initiate. As evidenced by the scouring during 2016 flooding, extensive armoring or hardening of the area surrounding the site would likely be needed to prevent*

undercutting of the cap slopes. The scouring could undermine the perimeter slopes and lead to slope failures, particularly in areas with steeper slopes. Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. Climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time frame that the dioxin waste would remain hazardous. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.129 Comment: Partial losses of a cap would not compromise its effectiveness like partial losses to a building or even a harbor protection structure (where partial losses might expose the harbor to full storm surges).

Response: *Partial losses of the cap may result in a release of dioxin to the environment; the purpose of the cap is to prevent such releases and prevent impacts to human health and the environment.*

2.5.130 Comment: Describing a best management practice in the Proposed Plan and tagging it with if practicable, if necessary, or if feasible means that EPA does not know whether the identified best management practices will actually work or are implementable to control releases of dioxin/furans and other contaminants into the San Jacinto River.

Response: *The best management practice is identified with qualifiers because the scope of past geotechnical investigation was limited and additional pre-design investigations may be necessary to assess the feasibility of certain best management practices such as water-tight sheet pile walls. The use of a cofferdam is considered to be the most effective best management practice to control releases and residuals for complete removal of the waste sludge and contaminated sediments at the San Jacinto River Waste Pits. Cofferdams offer flexibility in construction methods and material to accommodate the local site conditions and project goals. Additionally, the cofferdam can be placed outside of the armored cap to prevent disturbance of the contaminated sediment prior to containment. Cofferdams have been constructed in similar locales for excavation and construction activities such as at the Formosa Plastics, Texas site for contaminated sediment removal, at Matagorda Bay for archeological recovery and at numerous coastal sites for construction. Removal in the "dry" was performed to control organic chemical liquid releases in the upper 1 ½ miles of the Housatonic River site using cofferdams and by-passing the river flows. Sheet pile wall cofferdams have been used in a large sediment removal in the "dry" project in the Grand Calumet River in Indiana to control organic chemical liquid releases. Berms have been employed to form cofferdams to control resuspension at Hooker Chemical site in New York.*

2.5.131 Comment: EPA's seemingly simple and theoretical approach to remove the rock cap and geotextile is technically flawed. There is no precedent for removal of an engineered armor rock cap and the underlying geotextile. As stated by Dr. Todd Bridges, the U.S. Army's Senior Research Scientist for Environmental Science and Director of the Center for Contaminated Sediments at the Engineer Research and Development Center (ERDC) with respect to the proposed removal of the rock cap and geotextile at the Site, "It's never been done. It will result in a huge mess of turbidity, re-suspended sediments, and residuals."

Response: *The comment is based on removal in the wet where water is able to be transported through the site. To eliminate this potential exposure during removal operations, the removal would need to be performed in the "dry" by dewatering the site. The US Army Corps of Engineers agrees that the armor rock cap and underlying geotextile cannot be removed efficiently without simultaneously removing contaminated sediment. The cofferdam would be placed outside and surrounding the existing armored cap so as not to disturb, resuspend and release contaminated sediment during construction of the cofferdam nor complicate and interfere with armored cap removal. The armor stone would need to be disposed in a landfill with the contaminated sediment unless the stone can be washed and reused. The entire capped area will be completely encircled during removal.*

2.5.132 Comment: EPA has not demonstrated an understanding of the technical challenges (e.g., underwater removal of the rock, how to peel back the rock and geotextile to install sheet pile, how to remove the geotextile from the entire site, how to pick it up without creating a large dispersion of residuals and suspended sediments, how to remove the cap and geotextile in small sections, and how to deal with the cement used to treat and stabilize the waste in the western area) nor evaluated the environmental ramifications associated with the actual removal of the cap and geotextile.

Response: *The comment is based on removal in the wet where water is able to be transported through the site. To eliminate this potential exposure during removal operations, the removal will be performed in the "dry" by dewatering the site. The cofferdam would be placed outside and surrounding the existing armored cap so as not to disturb, resuspended and release contaminated sediment during construction of the cofferdam nor complicate and interfere with armored cap removal. The removal operation will be developed during the Remedial Design but removal of the armored cap is likely to progress continuously with removal of the contaminated sediment. The armor stone would need to be disposed in a landfill with the contaminated sediment unless the stone can be washed and reused. The solidified sediment in the western cell would be expected to have an unconfined compressive strength of about 60 psi, comparable to the strength of a moderately stiff clay. Conventional excavating equipment should be readily able to break and remove the sediment that had been stabilized with cement during armored cap construction. Appropriate excavating equipment that can accommodate the solidified sediment should be selected during the Remedial Design.*

2.5.134 Comment: The US Army Corps of Engineers estimated releases of dioxin/furans to the San Jacinto River from Alternative 6N was 2.0-2.37 grams, which is 0.34% of the total dioxins/furans to be removed from the pits. By just considering the additional releases from

blocked open buckets spilling their contents, the total released to the San Jacinto River from dredging in the Northwest Area and the deep water portion of the Eastern Cell would be 32 grams, which is greater than 5% of the dioxins/furans in the pits. (Bean Consulting)

Response: *The selected remedial action will include completely encircling the capped area with a cofferdam. Residual release will be minimized. Removal of the armored cap could have much greater impacts on resuspension and releases when removal in the wet is performed. The potential for greater releases provides the basis for selection of excavation in the "dry" within a cofferdam for the site.*

2.5.135 Comment: The US Army Corps of Engineers stated that Alternative 6N would "still" set back the natural recovery of the site to existing conditions by up to a decade considering the time required for design, construction and assimilation of the releases into the sediment bed below the bioactive zone (US Army Corps of Engineers 2016 page 5). Importantly, this statement does not take into account the additional significant sources of resuspended contaminants and residuals that were not adequately considered in the release calculations, i.e., releases from dredging and auxiliary vessels, geotextile removal, more dredging passes, and loss of residuals under silt curtains. If these releases were adequately addressed, how many more decades would the recovery be set back?

Response: *Greater releases than estimated would increase the time that recovery would take to achieve background contaminant concentrations when using dredging to achieve removal. The potential for greater delay in recovery provides another reason for selection of excavation in the "dry" within a cofferdam as the selected remedial action. Excavation in the "dry" minimizes the potential release of contaminant and prevents any set back in the natural recovery of the site.*

2.5.136 Comment: Due to the ambiguous identification of the proposed best management practices and their location, the constructability of Alternative 6N cannot be determined. These are critical to understanding the technical feasibility of 6N, the extent of impacts to the San Jacinto River, and the costs. These are not areas for research and development at the Remedial Design stage. If they don't work, that would mean that Alternative 6N has been selected and justified on a faulty basis.

Response: *The EPA and US Army Corps of Engineers are aware of the challenges associated with the constructability of Alternative 6N. These challenges are not detailed in the Proposed Plan because these details will be addressed during the Remedial Design. A cofferdam is proposed as the best management practice for implementing excavation in the "dry". The components of Alternative 6N have been implemented at numerous sites and are therefore considered to be technically feasible. The cofferdam would be placed outside and surrounding the existing armored cap so as not to disturb, resuspend and release contaminated sediment during construction of the cofferdam nor complicate and interfere with armored cap removal. The exact placement location of the cofferdam is a design issue to be addressed during the design phase.*

2.5.138 Comment: Excavation in the "dry" is a misnomer for this project. For example, excavation of the first two feet or so in the Western Cell will be in the "dry", being above the river level. Below that level, the wastes will start to become water logged and saturated. Pumps will attempt to dewater the wastes, and keep up with the seepage through the sheet piles, but the wastes will remain saturated. The other source that will keep the wastes in a wet condition is the seepage from upwelling from below the waste pits. The depth of the wastes in the pits was estimated to be 10 feet (US Army Corps of Engineers 2016, page 99).

Response: *Excavation in the "dry" refers to removal in an unflooded state. The best management practice being proposed is a cofferdam and sheetpile wall with sealed joints and the cofferdam will be filled with low permeability soil to control seepage through the cofferdam. The foundation soils include at least 10 feet of low permeability soft silt and clay immediately below the waste layer and underlain by a sand layer of similar thickness. The sand layer is underlain by more than 25 feet of hard, dense Beaumont clay. The cofferdam would be anchored in the Beaumont clay layer and would cut off the sand layer and limit the potential seepage. Upwelling through the low permeability clay layer is expected to be slow. The majority of the waste is expected to be soft and saturated. Construction activities on saturated sediments is also commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River waste pits.*

2.5.139 Comments: Storms and flooding events are also not adequately considered in the EPA's 19-month construction period. No doubt, no crystal ball exists to predict the weather, but the US Army Corps of Engineers considered storms to be a real threat during construction. The US Army Corps of Engineers suggested that construction only occur during the offseason for hurricanes and tropical storms, i.e., when there is a lower probability of tropical storms and flooding conditions (US Army Corps of Engineers 2016, page 186). Due to the many implementation issues, the disturbed waste will be exposed for longer periods of time than contemplated by EPA.

Response: *Weather related impacts on construction duration is a common issue for all Superfund waste removal projects. The use of best management practices will minimize these impacts at the site. For example, a cofferdam and sheetpile wall will surround the site. The cofferdam may consist of a ringed structure constructed with two walls of sheet piles with sealed joints driven into a low permeability foundation layer and filled with soil to limit seepage. The cofferdam can be placed outside of the armored cap to prevent disturbance of the contaminated waste. The intent of the cofferdam elevation is to reduce the probability and frequency of inundation, limit the scour potential if inundated, reduce the potential volume of water to be treated from multiple dewatering events at the site, and restrict the size of delays in production. The site will remain covered with the armored cap until the cofferdam encircling the site is completed, maintaining the current level of protection at the site. The amount of waste exposed at any time will be greatly reduced by incremental removal of the armor cap and the waste material. As such, only a small sloped face of contaminated material would be exposed at any time, limiting the potential for contaminant releases. Removal operations would be stopped during hurricanes and flooding and would not resume until flooding has receded and the site has*

been dewatered. However, excavation is not likely to be the limiting process, but multiple excavators could be used if needed. Instead, transportation, decontamination, and the rate that the landfill is able to accept wastes are likely to be the controlling factors for construction time. A final schedule will be developed during the design phase. Weather related issues will be included in the operations plan as will appropriate contingencies.

2.5.140 Comments: EPA reports various deficiencies in the TCRA cap, resulting from erosion, deficiencies in operation, maintenance and monitoring (OMM), and construction deficiencies. It is recommended that EPA describe in more detail why correct actions in the cap design would not sufficiently address the threats to human health and the environment under a permanent remedy for the Site.

Response: *Even though Alternative 3aN consists of an upgraded cap, it is still subject to the uncertainties of severe floods, a dynamic river, and adequate maintenance over the centuries that the waste will remain toxic. Climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time frame that the dioxin waste would remain toxic. The cap design uncertainty arises from the potential increase in storm intensity by an unknown amount over the centuries that a cap would need to maintain its effectiveness. The storm intensity uncertainty, coupled with the inherent uncertainties of the models used to predict the future performance result in a highly uncertain prediction of the ability of a cap to reliably contain the waste. The Corps of Engineers did performe a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.*

2.5.142 Comment: It is recommended that EPA further describe the potential short and long-term releases associated with Alternative 4N, which proposes additional solidification, in comparison to the full removal Alternative 6N.

Response: *A further description of Alternative 4N will be included in the Record of Decision, but in general, Alternative 4N would be subject to both the potential long term releases associated with a cap failure, especially for the areas that are not stabilized, as well as the potential releases associated with removal of the cap.*

2.5.143 Comment: EPA summarizes the US Army Corps of Engineers Report on page 8 of the Proposed Plan, stating that the US Army Corps of Engineers recommended a 15-inch stone, but the US Army Corps of Engineers report appears to references a 12-inch armor stone.

Response: *The US Army Corps of Engineers did discuss 12-inch armor stone in their "Evaluation of the San Jacinto Waste Pits Feasibility Study Remediation Alternatives" (2016)*

report, but ultimately the US Army Corps of Engineers recommended 15-inch armor stone for the Alternative 3aN upgrades as reported in the Proposed Plan.

2.5.144 Comment: EPA's summary of Remedial Alternatives (Proposed Plan, page 21) should note that the TCRA costs for the present solidification and cap, reported to be $9 million, are not included in estimated costs for Alternatives 1N and 2N.

Response: *The costs for the time critical removal are not included in the costs, nor were the past operation, monitoring, and maintenance cost included, because the Proposed Plan addresses the final remedy decision for the Site, and considers the future costs required to implement each of the alternatives, for comparison.*

2.5.145 Comment: The draft NRRB Recommendations is a helpful review of the record. Although EPA has responded to issues raised in the NRRB Recommendations in its Proposed Plan, it is recommended that EPA expand its response to the statement made in the NRRB Recommendations, Remedy Effectiveness, page 11 that treatment alternatives have not been sufficiently evaluated. While EPA notes that the EPA Feasibility Study addresses solidification in Alternative 4N, it is recommended that EPA develop the record to more thoroughly support its rejection of the possibility of solidifying more waste as a permanent remedy. Solidified waste would be far less susceptible to the flood events for which EPA expresses concerns for alternatives in which wastes are left on the Site.

Response: *The solidified areas in Alternative 4N are less susceptible to flood events, however, removal of the armor cap required to perform the solidification would expose the waste material to the same potential releases as the other alternatives that include removal of the cap. The areas that are outside of the solidified area would still be subject to the same long term uncertainty associated with cap stability as the other alternatives that include capping. The Record of Decision will describe the considerations for Alternative 4N.*

2.5.146 Comment: The Final US Army Corps of Engineers Report pre-dates the final EPA Feasibility Study and the final US Army Corps of Engineers Review did not include review of the final EPA Feasibility Study analyses. It would be helpful if EPA could make a determination with respect to the potential effectiveness of specific recommendations made in the US Army Corps of Engineers Review for improvements of the TCRA cap or other aspects of possible remedies in its additional analyses of removal alternatives. In other words, if proposed modifications were made to the alternatives (e.g. as a deeper cap with larger stone), would EPA's determination with respect to the Proposed plan remain the same? (PHA/HDR)

Response: *The EPA considered the proposed modifications, which were included in Alternative 3aN. The EPA has selected Alternative 6N using the nine CERCLA remedy selection criteria as described in the Record of Decision.*

2.5.147 Comment: Both the US Army Corps of Engineers models and the Anchor QEA models use vertically mixed
assumptions with no stratification of flow. This is a serious limitation of the models being used to simulate sediment transport. An analysis to demonstrate whether or not the well-mixed

circulation models used are appropriate and reliable for this sediment transport application is advisable.

Response: *The US Army Corps of Engineers report discussed the model assumption regarding stratification and found that the using a depth average mode, as did AQ, would have negligible impact on the predicted sediment transport during a severe event. According to the report:*

> *"Due to the lack of vertical salinity data to be able to quantify the degree of salinity-induced stratification and the combination of hydrologic conditions and tidal flows during which at least partially stratified flows occur in the SJR estuary, it was decided to run LTFATE in the depth-average mode like AQ did with their models. Thus, both models assumed that the SJR estuary was well mixed, so it was not possible to quantify the impact of this assumption. This assumption is thought to have negligible impact on the predicted sediment transport during a severe event such as a flood or storm surge because the combined energy from the waves and wind-, river- and tide-generated flows would be more than sufficient to vertically mix the water column."*

2.5.148 Comment: As noted in previously submitted comments, neither the EPA Feasibility Study nor the US Army Corps of Engineers Report has noted the importance of bottom conditions on sediment stability or potential for remediation. It is recommended that EPA consider bottom conditions and their impacts on removal effectiveness and cost.

Response: *The US Army Corps of Engineers report discussed the bottom conditions and found that the bottom assumption did not have a significant impact on the results obtained by AQ's models. According to the report:*

> *"Use of hard bottom in the HSC and in the upper reach of the SJR: The effect of this assumption in AQ's model framework was tested by determining the differences in the composition and thickness of the sediment bed at the SJR Site as predicted by AQ's models and LTFATE in which a hard bottom was not assumed in these two waterways. The differences were within the range of uncertainty associated with these models. The uncertainty associated with the limited sediment data in these waterways that were used to specify the sediment bed properties in LTFATE was included in this analysis. As a result, this assumption was not found to have a significant impact on the results obtained by AQ's models."*

2.5.149 Comment: It is recommended that a pre-design investigation (PDI) be conducted during the remedial design for each of the treatment or removal alternatives (Alternatives 4N-6). This is important for the northern impoundment, to confirm the physical nature of sediments, condition of the Site (topography/bathymetry), and extent of constituents of concern (COCs) in sediment/soil exceeding PRGs. The PDI would provide recent information for the remedial design phase, such as if contaminant levels in surface sediment and soil have been affected by land use such as the installation of new upland asphalt and local dredging) or weather events such as flooding or alterations in channel geometry, which may have spread or incidentally contained contamination. The MNR periodic sampling program can also be refined during the

PDI. ICs, such as fencing, signage, and buoys and BMPs, such as erosion control, silt curtains, and storm water pollution protection associated with the selected remedy, can also be more fully scoped during the PDI.

Response: *An investigation during the Remedial Design is anticipated to clarify the various design factors associated with implementation of Alternative 6N. The current condition during the design phase of the Sand Separation Area and the ground water will also be assessed. However, the Remedial Investigation has already determined the nature and extent of the contamination at the Site and there are no plans to repeat this. Topographic and bathymetric surveys are being conducted on a quarterly basis as a part of the ongoing quarterly Site inspections, and these surveys will continue.*

2.5.150 ***Comment:*** EPA asserts that *sonar tests in a 130-foot section south of the I-10 Bridge located adjacent to the Site found about 10 to 12-feet of erosion from the bottom of the river bed.* Channel scour downstream from bridges (such as that observed downstream of the I-10 bridge as a result of the 1994 flood) or other hard structures is not indicative of scour processes that will be operative at the Northern impoundments in the future, unless a bridge is built immediately upstream. Sonar examinations of the riverbed in the vicinity of the Interstate 10 crossing after the 1994 flood are described by NTSB (1996): "The Texas Department of Transportation evaluated the extent of scour around the substructure of critical sections of the two Interstate 10 bridges (east- and west-bound). The results of the sonar tests performed on October 21-22, 1994, documented 12 locations in the main channel for distances up to 130 feet south of the east-bound Interstate 10 bridge." During this extreme event, scour was limited to a region in the main channel 130 ft south (downstream) from the east-bound bridge. Scour was not reported upstream from the crossing, between the bridges or outside the main channel. The Northern and Southern Impoundments were not scoured during the 1994 flood, despite the 10-12 ft of scour in the main channel downstream from the bridge and the fact that the Northern Impoundments were not capped at the time. The peninsula containing the Southern Impoundment is immediately downstream from the Interstate 10 crossing, but it would be impacted by bridge scour only in the event of a major realignment of the San Jacinto River main channel. As noted above, that channel has been stable and nearly static for a century and exhibits characteristics similar to stable rivers found elsewhere. Such a major realignment would be highly unlikely.

Response: *EPA agrees that a major realignment of the San Jacinto River channel would be unlikely. However, about 8-feet of riverbed scour along the eastern side of the site was discovered following the flooding in 2016, which raises concerns regarding the potential for long-term undermining of a portion of the cap. Scouring at or near the waste pits during the 1994 flood is also unknown as no measurements were made in this area. This contributes to uncertainty in long-term performance.*

2.5.151 ***Comment:*** EPA asserts that changes to the site *(i.e., loss of land at the waste pits site due to erosion and subsidence)* will likely continue in the future. As noted above, the major driver of historical land loss at the Site was subsidence, which has been arrested by institutional controls such as those on groundwater extraction. Additional historical land loss was due to sand mining and in-channel dredging, which are now also restricted or banned in this area. It follows that land loss due to these factors should not continue in the future unless the driving factors are re-

activated. At any rate, scientific data and tools are available to quantify risk regarding future morphologic changes impacting the Site (Hayter et al. 2014).

***Response**: EPA agrees with the comment that much of the changes in elevation of the site have been arrested by institutional controls (restrictions on ground water pumping); although past capping and potential future capping may induce additional subsidence or slope stability concerns in some sections of the site. Additionally, diverting flow around the waste pits may have resulted in scour along the eastern side of the site during flooding in 2016. Additional armoring and slope/toe protection could provide additional protection; however, long-term monitoring and maintenance would be required. Scouring at or near the waste pits during the 1994 flood is unknown as no measurements were made in this area. This contributes to uncertainty in long-term performance. The history of erosion of the San Jacinto River is pointed out in the National Transportation Safety Board's report (PB96-917004, NTSB/SIR-96/04) on the October 1994 San Jacinto River flooding; the NTSB report stated:*

> *"The flooding caused major soil erosion in the flood plain and river channel, including the creation of water channels outside the San Jacinto River bed. The flood waters scoured the riverbed and banks, destabilized roads and bridges, and inundated area homes. The largest new channel (approximately 510 feet wide and 15 feet deep) was created when the river cut through the Banana Bend oxbow just west of the Rio Villa Park subdivision. A second major channel cut through Banana Bend just north of the channel through the oxbow. Both these channels cut through areas where sand mining had been performed previously."*

2.5.152 ***Comment:*** EPA asserts that Corps (Hayter et al. 2016) models (and any existing sediment transport model) cannot simulate river channel changes due to bank erosion, shoreline breaches, etc. during a high flow event caused by a major flood or hurricane. Therefore, the model predictions should be considered as having a very limited long-term reliability. Models are developed to evaluate specific situations or answer specific questions. Models themselves do not represent predictions; however, interpretations of model output can be used to predict future outcomes. Models can also be used to simulate a hypothetical scenario in order to evaluate a possible future state. Model uncertainty can be evaluated and quantified. As noted in the Proposed Plan, the Corps' hydrodynamic simulation model (Hayter et al. 2016) does not predict lateral movement or avulsion of the channel. Accordingly, the 2D hydrodynamic models (Hayter et al. 2016, AQ 2012) have not been used to evaluate potential larger scale river processes such as localized bank erosion, channel migration, or avulsion. To date, the models have been used to answer specific questions related to conditions directly adjacent to the cap. However, notwithstanding their limitations, these and similar models can quantify shear stresses impinging on the Northern and Southern Impoundments under "worst-case" extreme events (or more frequent) events. Evaluation of these stresses in light of critical stresses needed to erode the channel boundaries and floodplains can give an indication of the potential for channel migration or avulsion to initiate. Such an evaluation should consider reaches up- and downstream from the Site. In fact, models developed by Hayter et al. (2016) in support of the Proposed Plan might have been used to perform such an analysis if they captured stresses on the floodplain during overbank flow conditions. However, the work plan presented by Hayter et al. (2016), as requested by the EPA, did not include this task. The current version of HEC RAS 5.0 includes

the USDA-ARS Bank Stability and Toe Erosion Model (BSTEM). Although it cannot simulate large-scale channel change, it can simulate bank erosion. This model could have been used to examine bank erosion rates and erosion potential under various scenarios. Recently-developed, "morphodynamic" simulation models (e.g., Langendoen et al. 2015 and 2016) simulate lateral channel migration and predict future channel alignments. Thus, contrary to EPA's assertion, simulation of avulsions (cutoffs) and subsequent channel response would have been possible.

***Response**: The US Army Corps of Engineers did not attempt to perform morphodynamic simulations during its modeling of cap stability and erosion. The US Army Corps of Engineers found that the hydrodynamic and sediment transport modeling was sufficient to establish concerns regarding the site stability. Demonstration of shear stresses sufficient to erode larger than 8-inch stone as shown in the modeling was sufficient to indicate potential for channel migration to initiate.*

2.5.153 ***Comment:*** EPA asserts that future storm intensity and flooding may be even more intense due to climate change, sea level rise, and continued urban development. Greater submergence due to sea level rise may further reduce hydraulic loads during the most extreme events. The Northern Impoundments' location just upstream of the I-10 crossing and rising sea level will place it under backwater conditions and in a depositional rather than erosional environment for the most extreme events. In fact, considering a wide range of events, the Site is already depositional. Hayter et al. (2016) found that net average long-term sedimentation rate averaged over the area of the existing cap is 1.3 cm/yr.± 0.8 cm/yr. Similar findings were reported by AQ (2012). It is assumed that as additional information becomes available about storm intensity and hydraulic loadings under future climate and sea level scenarios, these data could provide a basis for quantitative analysis. If appropriate engineering analyses indicate potential for unacceptable hydraulic loading on the Impoundments or river channel movement over the period of interest, there are structural measures (river training structures such as groins, spurs, jetties, revetments or bank protection structures) that could be designed, in accordance with standard guidance and with appropriate factors of safety, to address such conditions.

***Response**: Greater storm intensity would lead to larger impacts from waves, particularly in shallow locales. While the site is net depositional as a whole, specific points are not; localized scour of about 8-feet has been observed adjacent to the cap. Structural measures such as groins, spurs, jetties, revetments, or bank protection structures would be subject to the same uncertainties as an armored cap, would increase the construction costs related to the capping alternatives, and would need to be monitored and maintained, as well as the site.*

Climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf. Modeling was considered to simulate the impact of a larger Category 4 or 5 hurricane, which may occur with their associated more intense storm surge and wind driven waves. However, attempting to simulate these storms would add another layer of uncertainty to the results because there is no actual storm data for these hurricanes in the area. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.154 *Comment*: The Final Interim Feasibility Study and Proposed Plan reflect a clear bias in Region 6 against containment as an effective remedy approach. Alternative 3aN was not selected as the preferred alternative based on EPA concerns over an ultra-extreme flow condition, based on a 500-year reliability benchmark. The use of a 500-year event is extreme and is inconsistent with EPA technical guidance for capping.

Response: *EPA does not agree that ultra-extreme flow conditions were used to assess the San Jacinto site. Technical guidance does not provide a specific design or evaluation criteria for flood return period, but rather states that it should be appropriate for the risk posed by a failure. For comparison purposes, the guidance states that the design life for a bridge or dam is 50 years and that the ability to predict forces or conditions for events with a return period greater than 100 years is restricted by the available data from historic records. However, timeframes of hundreds of years have been considered for calculations of contaminant flux and adsorption. Additionally, nuclear waste disposal facilities are designed for tens of thousands of years. Again, the required permanence is dependent on the risk posed. The waste pits site poses considerable uncertainty due to frequency of flooding and tropical storms. The flood rates used to assess the San Jacinto waste pits are not unusual for the location of the site; the conditions modeled in the August 2016 US Army Corps of Engineers Report resulted in a river flow rate of 390,000 cubic feet per second, which is only 8 percent greater than the 360,000 cubic feet per second flow rate reported during the October 1994 flood. Further, there were two other San Jacinto River floods during the 20th Century of greater intensity than the 1994 flood based on the Sheldon river gauge station (flood stage as follows: 32.90-feet on May 1, 1929; 31.50-feet on November 16, 1940 compared to 27.09-feet on October 19, 1994). Further, the recent flooding associated with Hurricane Harvey resulted in a 500-year flood in the San Jacinto River based on Harris County's Flood Warning System.*

2.5.155 *Comment:* EPA dismisses the fact that a containment remedy approach can be designed and implemented at this Site to provide secure and permanent isolation of the waste.

Response*: A containment remedy approach can be designed and implemented at this Site. However, containment presents a number of challenges as well as monitoring, maintenance and repair. Analysis of the site shows significant potential for erosion and considerable uncertainty in the range of potential shear stresses that the site will experience.*

2.5.156 *Comment:* Alternative 3aN contains provisions that would ensure stability against very extreme events. This Alternative was essentially dismissed by EPA for the same reasons they rejected Alternative 3N, even though 3aN is a significantly more robust containment alternative.

Response*: Containment also presents a number of challenges as well as monitoring, maintenance and repair. Analysis of the site shows significant potential for erosion and considerable uncertainty in the range of potential shear stresses that the site will experience. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are*

possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.157 ***Comment:*** The Proposed Plan indicates that the preferred remedy was selected based on the Final Interim Feasibility Study as supported by the US Army Corps of Engineers Report. But, the details on long term effectiveness and implementability for the alternatives in both the Final Interim Feasibility Study and Proposed Plan were selectively cited from the US Army Corps of Engineers Report to support a removal alternative. In plain language, the Proposed Plan cherry picked statements from the US Army Corps of Engineers Report to support removal, while largely ignoring considerations in the US Army Corps of Engineers Report that clearly supported a containment alternative.

Response*: The US Army Corps of Engineers report contains information on the shortcomings and strengths of all of the alternatives without providing a recommendation or preference for the selection of an alternative. Capping would yield very low short-term releases while leaving the potential for failure under extreme events or stream bed morphological changes. Removal could also yield very low short-term releases under favorable construction conditions with the most stringent best management practices and eliminate the potential for failure in the future. Removal with less than the most stringent best management practices would likely yield considerable short-term releases. In light of the risks posed by dioxin containing wastes, the preferred remedy considered these strengths and weaknesses of the alternatives in its selection of removal in the "dry" using a cofferdam to control short-term releases.*

2.5.158 ***Comment:*** There is no precedent for a remedy similar to Alternative 6N that involves de-construction of a secure containment and subsequent removal and transport of hazardous waste under these site conditions. The existing Time Critical Removal Action cap has soundly contained the waste since its construction. Repairs made to the existing cap have been minor and appear to be consistent with either flaws during the construction of the cap or a barge strike. There have been no documented releases of dioxin from the containment now in place.

Response*: The existing temporary cap was constructed as an interim measure to stabilize the waste pits while a final remedy could be developed. While the waste has been contained for the five years that the temporary cap has been in place, the cap has undergone a number of repairs that shows some of the weaknesses of containment. First, repairs were made on the western berm due to sloughing of the armor stone. Second, a 400 to 500-sq feet section of the cap in the Northwestern Area was repaired due to a failure that appeared to be caused by a bearing capacity failure from a poor filter layer and soft waste materials. Third, numerous locations in the Eastern Cell were repaired because the geotextile was exposed from apparent shifting or movement of the armor cap. Lastly, an area of scour nearly adjacent to the Eastern Cell was filled and armored from the edge of the cap to the outer limit of the scour hole. Consequently, the temporary cap appears to be less than secure containment.*

2.5.159 ***Comment:*** The comparison of Alternatives 3aN and 6N was developed on an inequitable basis. EPA's comparison of alternatives was pre-disposed toward removal as a remedy approach

and so inequitably exaggerated the disadvantages of a containment approach and dismissed the disadvantages of the removal approach.

Response*: Capping would yield very low short-term releases while leaving the potential for failure under extreme events. Removal could also yield very low short-term releases under favorable construction conditions with the most stringent best management practices and eliminate the potential for failure in the future. Removal with less than the most stringent best management practices would likely yield considerable short-term releases. In light of the risks posed by dioxin containing wastes, the preferred remedy considered these strengths and weaknesses of the alternatives in its selection of removal in the "dry" using a cofferdam to control short-term releases. When considering the balancing criteria for selection of a preferred alternative, there would be little preference between Alternatives 3aN and 6N (removal in the "dry") with regard to short-term impacts/effectiveness. In terms of implementability, there is not a clear preference since capping has issues with the filter layer in the Northwestern Area, and bearing capacity of the waste material to allow greater thicknesses and size of armor stone, while removal in the "dry" has issues with leakage/seepage and dewatering. Capping poses concerns with long-term effectiveness/permanence from disruption from barge strikes, erosion, and channel realignment, while removal has greater costs. In essence, the selection must choose between long-term effectiveness and costs in light of state and community acceptance.*

2.5.160 ***Comment:*** Alternative 3aN holds significant advantages over Alternative 6N since it has no short-term impacts, a lower risk of a catastrophic release of dioxin, and no implementability issues.

Response*: EPA disagrees that Alternative 3aN has a lower risk of a release of dioxin, and no implementability issues. Capping poses greater risk of a release of dioxin from erosion, scouring adjacent to the cap and channel realignment than from removal within a cofferdam. Capping also has implementability issues with the filter layer and slope stability in the Northwestern Area, as well as bearing capacity of the waste material to allow greater thicknesses and size of armor stone.*

The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.161 ***Comment:*** Alternative 3aN would entail modification of the current cap to meet the low probability barge strike and ultra-extreme storm and flow events described previously. his would involve placement of at least 24 inches of armoring material with a median diameter of 15 inches (which exceeds the US Army Corps of Engineers recommended median of 12 inches) as well as pilings to protect against barge strikes. This alternative involves enhancing the existing armored

cap and would not involve disturbance of the underlying waste. It would be easily constructed, and there should be no associated release of waste materials. The remedy is expected to require 15 months to implement according to the Final Interim Feasibility Study and Proposed Plan prepared by EPA. During this period, however, the Northern Impoundments at the Site would be protected by armoring that is at least equivalent to the current armoring which the US Army Corps of Engineers suggests has effectively contained contaminants over the past 6 years despite small areas of the cap that have required maintenance. The Proposed Plan suggests that there may be negative consequences of the additional rock placement including settling or expression of waste material beyond the cap. Settling of the current cap has not led to observable negative consequences and has likely led to some consolidation and strengthening of the underlying waste material. The expression of waste material beyond the cap is highly unlikely given the observed need for gentle slopes on armoring material that will extend the cap far beyond the boundaries of the waste.

***Response**: Placement of a thicker cap poses uncertainty and difficulties, particularly in the Northwestern Area. A 400 to 500-sq feet section of the cap in the Northwestern Area was repaired due to a failure that appeared to be caused by a bearing capacity failure from a poor filter layer and soft waste materials. Greater thicknesses and size of armor stone increase the potential for additional failure in this area. Additionally, the slope in the Northwestern Area is rather steep and susceptible to slope failure with the additional loadings from a much thicker armored cap. Considerable construction difficulties were encountered in placing the temporary cap in this area and additional difficulties should be expected from construction of Alternative 3aN. The slope cannot be readily flattened to a gentle slope of 1:3 or 1:5 without adding a very large quantity of material. Regarding the US Army Corps of Engineers recommendations for larger rock for Alternative 3aN, the US Army Corps of Engineers did consider 12-inch rock in their report (2016). However, the USAGE ultimately recommended the use of a larger 15-inch rock.*

2.5.163 ***Comment:*** Any effect of future storm events and potential climatic changes, expressed as a concern by EPA, will push the river toward adapting to future flows by erosion of the weakest portions of the river, namely the soft, fine-grained sediments and banks, rather than the highly armored cap structure. One could envision a situation, should a hypothetical event of maximum discharge and Hurricane Ike occurred simultaneously, that the Alternative 3aN cap would be the only engineered structure still largely in place along the San Jacinto River. In addition, partial losses of a cap would not compromise its effectiveness like partial losses to a building or even a harbor protection structure (where partial losses might expose the harbor to full storm surges). Failures of such structures generally occur not through erosion of a cap but by undermining of the structure through erosion of the softer material underneath. This is avoided in the proposed cap by extending the cap with modest slope well beyond the edges of the sediment desired to be contained.

***Response**: EPA does not agree that partial losses of a cap would not compromise its effectiveness because partial losses may result in releases of toxic dioxin to the environment. There will be locations on or adjacent to the cap that will be subjected to much greater shear stresses due to site geometries and convergence of flow around or over the site. As evidenced by localized scouring along the eastern edge of the East Cell during 2016 flooding, extensive*

armoring or hardening of the area surrounding the site would likely be needed to prevent undercutting of the cap slopes. The scouring could undermine the perimeter slopes and lead to slope failures, particularly in areas with steeper slopes. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.5.164 Comment: Digging up the waste and removing it will re-suspend the waste in the process. The Proposed Plan discounts the significant releases that the U.S. Army Corps of Engineers concludes will result from Alternative 6N, even with the use of enhanced Best Management Practices (BMPs). Some releases are inevitable despite use of BMPs and significant releases are likely to occur during heavy rain events or other storms that have been documented to occur locally at a regular frequency. In fact, the US Army Corps of Engineers Report notes that contaminant mobilization from resuspension is expected to release 400,000 times as much contaminants as currently occurs with the intact cap and possibly five times higher than that if a flood event occurs.

***Response**: The comment is based on removal in the wet where water is able to be transported through the site. To eliminate contaminant releases and residuals associated with removal operations, the removal will be performed in the "dry" by dewatering the Site. Consequently, the best management practices for the Site would need to include a cofferdam completely surrounding the site. The cofferdam may consist of a ringed structure constructed with two walls of sheet piles with sealed joints driven into a low permeability foundation layer and filled with soil to limit seepage. Portions of the sediment at the base of the cofferdam would be armored to prevent erosion at the base of the outer wall. Additionally, the cofferdam must be of sufficient height to prevent overtopping from most flooding events. All of the water pumped from the site, including site water, storm water, wash water and seepage, would be treated prior to discharge at the site. Removal in the "dry" eliminates the potential for resuspension and release of contaminants and contaminated water. It also prevents the formation of residuals from sedimentation and allows removal to the cleanup level by preventing the fluidization and spreading of the sediment in an uncontrolled manner. Additionally, removal in the "dry" facilitates the sampling, monitoring and testing of the site to ensure compliance.*

2.5.165 ***Comment:*** Alternative 6N is acknowledged by EPA to result in short term releases of dioxin during implementation. Under the selected removal option potential exposure to the contaminants of concern will be 4,000 times greater than with a secure closure in place.

***Response**: The comment is based on removal in the wet where water is able to be transported through the site. To eliminate this potential exposure during removal operations, the removal will be performed in the "dry" by dewatering the site as described in the response to Comment2.5.164. Removal in the "dry" eliminates short-term releases of contaminants and will*

perform comparably to secure containment in place without the potential of future cap failures. Based on comments, EPA has modified the removal approach and will now completely encircle the capped area with a cofferdam to control releases during the removal phase.

2.5.166 ***Comment:*** The US Army Corps of Engineers raised issues related to implementability of Alternative 6N that were dismissed by EPA by a hand wave mention of Best Management Practices (BMPs). EPA has not adequately identified and evaluated the implementation challenges associated with Alternative 6N. To assess whether the project is practicably constructible and whether EPA's cost estimate and schedule reflect the potential complexity and challenges associated with its implementation, much more information is needed on best management practices, including descriptions of where proposed sheet piles will be installed. In general, Alternative 6N is a very inefficient remedy. It has a much higher cost, much higher short-term risk, significant implementation issues, and longer construction time.

Response*: The EPA and US Army Corps of Engineers are aware of these challenges associated with Alternative 6N. These challenges are not detailed in the Proposed Plan because these details will be addressed during the Remedial Design. A cofferdam is proposed as the best management practice for implementing excavation in the "dry". The cofferdam would be placed outside and surrounding the existing armored cap so as not to disturb, resuspend and release contaminated sediment during construction nor complicate and interfere with armored cap removal. The foundation sediments outside of the boundaries of the armored cap may have greater strength and stability than the waste sludge which would further investigated in pre-design. The exact placement location of the cofferdam is a design issue that would consider foundation subsurface conditions, slopes, removal depths, potential for slumping and offset requirements. Refined estimates of costs and construction times will be developed during the Remedial Design.*

2.5.167 ***Comment:*** The result of EPA's "to be determined later" approach to best management practices and inadequate assessment of resuspension and residuals is a fundamentally flawed assessment of risks and prediction of the short and long term impacts of Alternative 6N.

Response*: The best management practice is identified with qualifiers and is cited "to be determined later" because the scope of past geotechnical investigation was limited. Additional pre-design investigations may be necessary to assess the feasibility of certain best management practices such as sheet pile walls with sealed joints. As described in the response to Comment 2.5.164 use of a cofferdam is considered to be the most effective best management practice to control releases and residuals, both short- and long-term impacts, for complete removal of the waste sludge and contaminated sediments at the San Jacinto River waste pits. Cofferdams offer flexibility in construction methods and material to accommodate the local site conditions and project goals. Additionally, the cofferdam can be placed outside of the armored cap to prevent disturbance of the contaminated sediment prior to containment. Cofferdams have been constructed and dewatered in similar locales for excavation and construction activities such as at Formosa Plastics, Texas site for contaminated sediment removal, at Matagorda Bay for archeological recovery and at numerous coastal sites for flood gate, bridge and tunnel construction. Armor stone and geotextile removal are common in shoreline and coastal construction projects. Access, staging, off-site transport and off-site disposal are common to*

sediment removal projects and capping projects. Water treatment has also been used at many sediment removal sites such as Fox River, Ashtabula River, Onondaga Lake and Grasse River where hydraulic dredging has been employed. Construction activities on saturated sediments is also commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River waste pits. Removal in the "dry" eliminates the potential for resuspension and release of contaminants and contaminated water. All impacted water would be pumped from the site and treated before being discharged. It also prevents the formation of residuals from sedimentation and allows removal to the cleanup level by preventing the fluidization and spreading of the sediment in an uncontrolled manner. Additionally, removal in the "dry" facilitates the sampling, monitoring and testing of the site to ensure compliance and prevent long-term impacts from residuals.

2.5.168 ***Comment:*** Excavation of this waste will initially be accomplished by bulldozers and dry land excavators, but as the removal gets deeper, the removal will likely need amphibious vessels that can work in the muck and mud. As the waste material is removed from the deeper depths, the ability to effectively dewater the site becomes more difficult. In order to continue operations, the equipment will need the capability to work in both flooded and semi-dry conditions. This is a real complicating factor, resulting in extra time and cost working in and attempting to remove the muck (i.e. the saturated waste materials), and will result in serious construction issues including impacts on the schedule. While amphibious equipment provides the ability to operate under more adverse conditions, it is less productive. This very time intensive work will result in the disturbed waste being exposed for long periods of time even if the armor cap and geotextile are removed in sections.

Response*: The majority of the waste is expected to be soft and saturated. Construction activities on saturated sediments is also commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River waste pits. Excavation is not likely to be the limiting process, but multiple excavators could be used if needed. Instead, transportation, decontamination, and the rate that the landfill is able to accept wastes are likely to be the controlling factors for construction time. The armored cap above a small section of the site would be removed first and then entire depth of waste material and contaminated sediment in that small section would be removed next. The excavation would then proceed in an adjacent section using the same approach. The size of the section would be dependent on the reach of the equipment and the slumping of the waste materials. Swamp mats can improve equipment mobility and increase efficiency. A sump would be excavated along the edge below the depth of contamination to collect runoff, seepage and drainage, and improve dewatering. The sump would be pumped down as needed to maintain a dewatered site.*

2.5.169 ***Comment:*** What would happen if a hurricane or flood occurred during construction activities? I would like to know more about how you're going to contain it when a hurricane comes through.

***Response**: The site will remain covered with the armored cap until the cofferdam encircling the site is completed, maintaining the current level of protection at the site. The height of the cofferdam is a design decision that will require further evaluation. The proposed elevation of 10 feet NAVD 88 was based on modeled elevations presented in the Feasibility Study for a design flood with a 25- to 50-year return period. Actual flood elevations at the northern San Jacinto waste pits are uncertain and require more study. For cost estimation purposes, the top elevation of the cofferdam was 14 ft NAVD89 to prevent inundation by a 100-year or smaller flood, with a flood stage at the Site for a 100-year flood at approximately 12 ft NAVD89. The intent of the proposed cofferdam elevation is to reduce the probability and frequency of inundation, limit the scour potential if inundated, reduce the potential volume of water to be treated from multiple dewatering events at the site, and restrict the size of delays in production. As described in the response to Comment 2.5.168, the armored cap would be incrementally removed as the waste material and contaminated sediment are excavated to depth. As such, only a small sloped face of contaminated material would be exposed at any time, limiting the potential contaminant releases. Removal operations would be stopped during hurricanes and flooding and would not resume until flooding has receded and the site has been dewatered. If the site is inundated by flooding, whether associated with a hurricane or not, the height of the proposed cofferdam and the short fetch length within the cofferdam would reduce flows and waves across the site and consequently the resulting bottom shear stress. The resulting shear stress would be too small to erode the remaining armored cap or residuals from the depths post-dredging.*

2.5.170 ***Comment:*** Transport of 13,300 to 17,500 truckloads of dioxin/furans wastes through crowded neighborhoods and a highly populated county (Harris County) on the way to the disposal site (undetermined at this point) will result in transportation safety issues and environmental threats.

***Response**: Concerns regarding transportation of contaminated sediment is a common issue for all Superfund sediment removal projects. Access to I-10 is only about 1½ miles from the site via the East Freeway Service Road, which is primarily used for non-residential, commercial/industrial traffic and trucking. The removal operation would fill one truck every 10 to 15 minutes and the total traffic at the operation would be about one vehicle every six minutes, including worker traffic and deliveries. There is little other traffic over most of the route to I-10. The traffic volume is inconsequential for I-10 and its ramps, representing about 0.2 percent of the average daily truck traffic on I-10 and less than 3 percent of the ramp capacity. Therefore, the operation would not be expected to result in transportation safety issues, but further evaluations of transportation issues will be performed during the Remedial Design. Potential spills of the wastes and contaminated sediments do not pose substantial short-term human health and environmental risk. The materials are not considered hazardous under RCRA and DOT regulations since the materials are not ignitable/flammable, corrosive, reactive or toxic as characteristic of hazardous materials. Risks develop from the long-term dermal exposure or ingestion of the contaminants. The Remedial Design will develop contingency plans to prevent long-term exposure and decontaminate any spills, including those resulting from vehicle accidents. The wastes would be contained in sealed and covered trucks and the trucks will be decontaminated before leaving the site to control releases of contaminants. The primary risks from the contaminated sediments are associated with the exposure in the aquatic environment*

where the contaminant is able to bioaccumulate in the tissues of aquatic organisms consumed by humans and predators.

2.5.171 ***Comment:*** Ensuring proper safeguards are in place and removal with best engineering practices is no doubt feasible. In fact, it has been completed successfully at other sites to date. With proper planning and third party oversight of the removal operation it can be a success.

Response: *Removal of contaminated sediment has been performed at more than 100 sites; ITRC (2014) presents information on more than 50 removal sites. Comparable excavation within a cofferdam was performed at the Formosa Plastics site in Texas, DuPont Gill Creek (SH1) site in New York. Removal in the "dry" was performed to control organic chemical liquid releases in the upper 1½ miles of the Housatonic River site using cofferdams and by-passing the river flows through large culverts. Sheet pile wall cofferdams have been used in a large sediment removal in the "dry" project in the Grand Calumet River in Indiana to control NAPL releases. The Phase I Removal Action in Passaic River included sheet pile enclosure as a cofferdam for dioxin contaminated sediment. Berms have been employed to form cofferdams to control resuspension at Hooker Chemical site in New York. Consequently, employing a double-walled cofferdam surrounding the site as the principal best management practice is expected to perform successfully.*

2.5.172 ***Comment:*** To build a coffer dam around the site and dig it out is safest way to handle this situation. This can be done with best engineering practices without spreading anymore of the toxins than already have been.

Response*: The EPA agrees that the removal would need to be performed within a cofferdam in the "dry" by dewatering the site to nearly eliminate contaminant releases and residuals associated with removal operations.*

2.5.173 ***Comment:*** What is the impact of safety and personal protection gear on project efficiency and schedules? This was not addressed in EPA's timeline**.**

Response*: No significant impact on project efficiency and schedules are anticipated due to safety and personal protection gear. The construction time estimates incorporate the use of routine safety and personal protection equipment typically employed at Superfund sites. No unusual safety gear such as supplied air respirators is needed for the project.*

2.5.174 ***Comment:*** The Proposed Plan minimizes the implementability challenges associated with removal, for example – dewatering, incremental excavation, removal of the existing cap, access, off-site transport and off-site facility, and construction duration. There are significant unknowns posed by the prospect of removing an armored cap with contaminated media below it – something that has never before been performed at any site. In addition, although the Proposed Plan indicates that much of the work can be performed under "dry" conditions, the dewatering that will be required to obtain such "dry" conditions presents significant implementability issues, including the siting and construction of dewatering facilities in a manner that prevents the release of contaminants. Moreover, the wastewater that is generated by dewatering must be treated. The Proposed Plan fails to take into account these obstacles to implementation.

***Response**: The EPA and US Army Corps of Engineers are aware of these challenges and the Proposed Plan did not seek to minimize the components of excavation in the "dry". These components are not addressed in the plan because these details will be addressed during the Remedial Design. Despite the challenges, these remediation components have been implemented in many construction and sediment remediation projects. Cofferdams have been constructed and dewatered in similar locales for excavation and construction activities such as at Formosa Plastics, Texas site for contaminated sediment removal, at Matagorda Bay for archeological recovery and at numerous coastal sites for gate, bridge and tunnel construction. Armor stone and geotextile removal are common in shoreline and coastal construction projects. Access, staging, off-site transport and off-site disposal are common to sediment removal projects and capping projects. Water treatment has also been used at many sediment removal sites such as Fox River, Ashtabula River, Onondaga Lake and Grasse River where hydraulic dredging has been employed. EPA recognizes the concerns regarding the treatment and disposal of site generated water. The pre-design investigations will support development of applicable requirements that will be reviewed for CWA 401 water quality certification. Construction activities on saturated sediments is also commonplace and techniques for working on soils with low ground strength are available such as use of swamp mats, marsh excavators, marsh cargo buggies, slide pontoons and other amphibious equipment. Similar equipment and techniques were used to place the armored cap at the San Jacinto River waste pits.*

2.6 San Jacinto River Characteristics

EPA received numerous comments from individuals in the surrounding communities, industry, industry associations, and non-governmental organizations regarding the San Jacinto River and its potential impacts on the Site the remedial action.

2.6.1 Comment: Although the riverine environment at the San Jacinto River Waste Pits is traditionally a depositional environment, the River has shown its immense force by cutting new channels and eroding large areas of material around the Pits. Most recently, the PRPs repaired a scoured area that was 60 ft. long and 8 ft. deep along the eastern side of the TCRA.

Response: *The most substantial and dramatic changes to river or estuarine environments occur as a result of extreme events, the effects of which are more difficult to predict. The San Jacinto River has experienced actual short-term changes in the past. For example, the October 1994 flood, reported by the National Transportation Safety Board, resulted in "major soil erosion in the flood plain and river channel, including the creation of water channels outside the San Jacinto River bed. The flood waters scoured the riverbed and banks, destabilized roads and bridges, and inundated area homes." (NTSB, 1996). The railroad and highway roadbeds and bridges sustained major damage during the 1994 flood (USGS, 1995). More recently, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject. The San Jacinto River has been prone to severe flooding with major floods occurring in 1907, 1929, 1932, 1935, 1940, 1941, 1942, 1943, 1945, 1946, 1949, 1950, 1959, 1960, 1961, 1972, and 1978 (NTSB, 1996). The actual history of the San Jacinto River is sufficient to raise concerns about the stability of structures constructed in the river over the long time frame that the dioxin waste would remain hazardous.*

2.6.2 Comment: Flooding via storm surge is the major threat to the waste pit site and surrounding properties. The position of the site close to the mouth of a river or freshwater inflow makes it especially vulnerable given the mechanics of a storm surge. There are actually two inundation events: first, the initial rise and pulse of water inundating the waste pit site; second, the backwash of water as the surge releases back into Galveston Bay and ultimately the Gulf of Mexico. The intense tidal flushing can essentially deliver a "double dose" of pollutants to upstream residents, as well as a single downstream dose as the water returns to the Bay. Based on the NOAA hurricane surge inundation zones, the waste pit site would be inundated by any hurricane and tropical storm due to its low elevation and vulnerable location. Given its vulnerability, the site will almost certainly experience repetitive erosive surge events in the coming years, further degrading the structural integrity of on-site protective devices.

Response: *The low lying Waste Pits are subject to flooding from storm surges generated by both tropical storms (i.e., hurricanes) and other storms. Storm surges generated in the Gulf of Mexico propagate into Galveston Bay and into the Lower San Jacinto River. Storm surge modeling conducted by the National Oceanic and Atmospheric Administration (NOAA) predicted that category 3 and 5 hurricanes that hit Galveston Bay during high tide would produce surge*

levels of 23-feet and 33-feet, respectively, at the Site (Hayter and others, 2016). The San Jacinto River Waste Pits site is located in a Federal Emergency Management Agency (FEMA) designated "VE" Floodway Zone, meaning that it is prone to inundation by the 1 percent annual chance flood event with additional hazards due to storm induced waves (Brody and others, 2014). Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time frame that the dioxin waste would remain hazardous.

2.6.3 Comment: The term "upstream" is often used in the supporting documents to describe water or sediment quality (contaminant) data. Professionals and lay readers may misinterpret this term to mean quality unaffected by the Site; however, that is not the case in a tidal estuary, such as the San Jacinto River. Tidal circulation and dispersion cause Site contaminants to move predominantly downstream, but they may also move upstream. EPA should explain this imitation of the term "upstream."

Response: *The term "upstream" for the purpose of the study area is identified as the "river area in the opposite direction of the predominant river flow direction" and as identified visually on Figure 10 of the Proposed Plan. The actual river flow may reverse directions at times depending on the water volume being released from the dam, tidal effects, and storm surges. Sampling results in the vicinity of the Site are used to define the extent of contamination around the Site, both upstream and downstream, and not a designation of whether an area is upstream or downstream.*

2.6.4 Comment: Clarify the differences between a 100-year storm and a 100-flood in the Proposed Plan and Feasibility Study. It would be helpful to identify that the "100-year" flood levels may change due to land subsidence, future changes in storm frequencies or intensities, or climate change.

Response: *A 100-year storm is a storm that, on average, has a 1% chance of occurring in any given year, or approximately once every 100 years. A 100-year flood is a flood that has a 1% probability of occurring in any given year. A 100-year storm does not necessarily result in a 100-year flood because there are several independent factors that can influence the relation between rainfall and river flow. These factors include the extent of rainfall in a watershed, the soil saturation before the storm, and the relation between the size of the watershed and the duration of the storm. Because the 100-year flood level is statistically computed using past data, as more data comes in, or when a river basin is altered in a way that affects the flow of water in the river, the level of the 100-year flood may change. Dams and urban development are examples of some man-made changes in a basin that affect floods. Clarification of the definition of a 100-year flood will be included in the Record of Decision.*

2.6.5 Comment: Why are the barges allowed to park on the north side of the I-10 bridge near the site with the potential to strike the cap and who approved this?

Response: *EPA has no control over the positioning of the barges.*

2.6.6 Comment: The Proposed Plan relies heavily on the possibility that the river may change course and in so doing, will destabilize the existing or enhanced cap. This possibility was based in part on historical river aerial photos during different stage/tidal conditions but not based on a full geomorphic evaluation of the river.

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic documents. Hayter and others (2016) refer to "the dynamic nature of the flow regime in the SJR [San Jacinto River] estuary" in their assessment of the hydrology and hydrodynamics of the river, referencing the location of the Waste Pits within the FEMA designated 100-year floodplain, susceptibility to flooding from storm surges, and vulnerability of the Site due to sea level rise. While it is possible to evaluate a river as dynamic in terms of its tendency towards lateral channel migration and channel avulsion, a "dynamic system" could be considered a system subject to a wide range of flooding and storm surges, and this type of activity will continue irrespective of the additional impacts of subsidence or dredging that might occur in the area. The frequency of hurricanes along any 50-mile segment of the Texas coast is about 1 every 6 years; the annual average occurrence of a tropical storm or hurricane is about 1 per year (Roth, 1997). Hurricane Ike, which made landfall near the north end of Galveston Island as a Category 2 hurricane (wind speeds of 96-110 miles per hour) caused storm surges of 15-20 feet above normal tide levels in much of the Galveston Bay area (National Hurricane Center, 2017). Warner and Tissot (2012) conservatively estimate a sea level rise at Galveston Bay of 2.1 feet over the 21st Century, and continuously increasing risks of flooding from storm surges as the century progresses. By this definition, the river could be considered dynamic, and becoming increasingly more so over time.*

It may be true that the fluvial channel of the San Jacinto River in the area of the impoundments is relatively stable. However, a tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location of the Waste Pits is subject. An analysis of San Jacinto River channel stability based on system history does not consider projected changing conditions, such as sea level rise, that could affect system stationarity and therefore stability.

While the argument can be made that the upstream channel changes due to the 1994 flood specific to the Banana Bend area did not occur downstream at the Site because channel conditions are different, this is not to say that there were no changes in size and flow paths of the river at the Site during the flood. Net erosion of 10-12 ft in the river bed downstream of the I-10 bridge (NTBS, 1996) suggests the erosive power of flow at the bridge and in the vicinity of the impoundments was significant. Simulation of the 1994 flood by Hayter and others (2016) using the hydrodynamic module in LTFATE predicted a maximum of 6.0 ft of scour in the reach of the San Jacinto River around and a short distance downstream of the substructure of the two I-10 bridges.

Sea level rise in the Galveston area is conservatively projected to be 2.1 feet over the 21st Century (Warner and Tissot, 2012), which will cause storm surge floods to progress further inland, and increase the frequency and intensity of flooding in the area of the impoundments. Despite being designed to withstand a 100-year flood, and in the absence of floods of this

magnitude since the cap was in place, portions of the current armor cap have needed repair on an annual basis. Current models are not designed to simulate the potential combination of downstream dam releases due to flooding, onshore storm surges and flooding due to hurricanes, decreased ground stability due to saturated conditions, and the increased occurrence of higher intensity storms, making the evaluation of erosion risk in the area of the impoundments problematic. The actual history of the San Jacinto River is sufficient to raise concerns about the stability of structures constructed in the river.

2.6.7 Comment: The Proposed Plan should include evaluation of potential river changes that could occur and how quickly those changes could occur. That evaluation should then be the basis for development of an operations and maintenance plan. Rivers usually change over hundreds of years, which is why there is operation and maintenance.

Response: *The most substantial and dramatic changes to river or estuarine environments occur as a result of extreme events, the effects of which are more difficult to predict. The San Jacinto River has experienced actual short-term changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board, resulted in new channels eroding in the floodplain and undermining of pipelines in the area. Further, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject. The actual history of the San Jacinto River is sufficient to raise concerns about the stability of structures constructed in the river.*

A long term maintenance program would generally have the most application for a containment remedy, which would need to secure the impoundments for a long time. The ground water and the surface water would require regular sampling and review to confirm that there are no future releases, in addition to the regular containment structure inspections to confirm its continued integrity. Climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges. Predicting long-term future conditions on which to base a maintenance plan would be uncertain.

2.6.8 Comment: A full geomorphic evaluation should be completed to assess the potential for the configuration of the river to change abruptly

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic documents. However, geomorphic evaluations based on the behavior of upland river systems may not accurately simulate scenarios in a river downstream of a reservoir and in immediate contact with a tidal estuary. Also, what cannot be accurately predicted are the conditions that the impoundments and channels will be subjected to, given the need to secure the impoundments for the long time that the dioxin would remain hazardous. The San Jacinto River has experienced actual short-term changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board, resulted in new channels eroding in the floodplain and undermining of pipelines in the area. In addition, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the*

potential for change and the dynamic nature of the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject.

2.6.9 Comment: What is the chance of the cap failing vs geomorphic change occurring? Performing a geomorphology analysis to evaluate the potential for abrupt changes in the river channel that might impact the Alternative 3aN cap and to determine whether engineering solutions exist for those potential impacts.

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic documents. A variety of models could be used to test potential effects to specific areas of the stream channel or impoundments with the application of specific stress conditions. However, the complex way in which the effects of these individual stresses interact and propagate through the river system in the area of the impoundments cannot be reliably simulated with existing models. The San Jacinto River has experienced actual abrupt changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board, resulted in new channels eroding in the floodplain and undermining of pipelines in the area. In addition, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject.*

2.6.10 Comment: Region 6 explicitly bases its rejection of Alternative 3aN on the possibility of a future abrupt change in the San Jacinto River's channel as a factor that could potentially cause the Alternative 3aN cap to fail. Region 6 did not, however, conduct a formal geomorphic evaluation of the river. In fact, the Administrative Record does not contain any credible support for concluding that the river could change course in the manner it speculates could occur.

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic documents. However, geomorphic evaluations based on the behavior of upland river systems may not accurately simulate scenarios in a river downstream of a reservoir and in immediate contact with a tidal estuary. Also, what cannot be accurately predicted are the conditions that the impoundments and channels will be subjected to, given the need to secure the impoundments for the long time that the dioxin would remain hazardous. The San Jacinto River has experienced actual short-term changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board, resulted in new channels eroding in the floodplain and undermining of pipelines in the area. In addition, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject. Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk*

of flooding and storm surges over the long time frame that the dioxin waste would remain hazardous.

The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.6.11 Comment: Region 6's stated rationale for not undertaking such an evaluation is that modeling has limited applicability to geomorphic changes. Whatever the perceived limitations of modeling as a tool to evaluate such an event may be, that does not excuse Region 6 from performing a technical evaluation to support this claim. That is particularly true because Region 6 points to this argument as one of its primary reasons for rejecting capping as a protective remedy.

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic documents. A variety of models could be used to test potential effects to specific areas of the stream channel or impoundments with the application of specific stress conditions. However, the complex way in which the effects of these individual stresses interact and propagate through the river system in the area of the impoundments cannot be simulated with existing models. The San Jacinto River has experienced actual abrupt changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board, resulted in new channels eroding in the floodplain and undermining of pipelines in the area. In addition, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the river. The actual history of the San Jacinto River is sufficient to raise concerns about the stability of structures constructed in the river. A tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject. Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time period that the dioxin waste would remain hazardous.*

2.6.12 Comment: With regard to Region 6's assertions about abrupt river channel migration: There is no support for Region 6's assertion that the river channel has "changed over time," based on a limited set of aerial photographs from 1956, 1966, 1973, and 1997. These photographs visually show inundated areas but not "channel migration" and do not support Region 6's assertion that they "clearly show that the river channel has changed over time." In fact, although the river is a dynamic system, which is subject to changes in size and flow paths, the main channel of the river is very stable.

Response: *A tidal river, as exists at the Site, is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location is subject. Analysis of channel stability based on system history does not consider projected changing conditions, such as sea level rise, that could affect system stationarity and therefore stability. The San Jacinto River has experienced actual abrupt changes in the past. For example, the 1994 flood, reported by the National Transportation Safety Board (NTSB, 1996), resulted in new channels eroding in the floodplain and undermining of pipelines in the area. In addition, the river bed scour that was identified in 2016 adjacent to the temporary cap also points to the potential for change and the dynamic nature of the Site location. The actual history of the San Jacinto River is sufficient to raise concerns about the stability of structures constructed in the river. Finally, climate models (Knutson and others, 2010) predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges over the long time period that the dioxin waste would remain hazardous.*

To provide more detail to the response, the NTSB (1996) report refers to sonar tests performed around the substructure of critical sections of the I-10 bridge, but there was no specific reference in the NTSB (1996) report to tests over the entire area of the Northern Impoundment, or reference as to whether the impoundments were eroded. Despite a search of available literature, no additional references were found giving more detail about where the sonar tests referred to in the NTSB (1996) report were located, so the statement that "The Northern and Southern Impoundments were not scoured during the 1994 flood, despite the 10-12 ft of scour in the main channel downstream from the bridge and the fact that the Northern Impoundments were not capped at the time" cannot be evaluated. Classification schemes such as those by Lagasse and others (2004), used to establish channel stability, were designed to classify upland river systems. The San Jacinto River in this reach is downstream of a dam and is part of a coastal plain estuary. As such, there are additional forces acting on the river, such as downriver releases from the dam and upriver/onshore forces such as hurricanes and storm surges, which can affect the morphology of the area in ways not accounted for in an upland river classification scheme. A 2 ft rise in sea level (Warner and Tissot, 2012) and an increase in the frequency of high intensity hurricanes due to a rise in sea surface temperatures (Knutson and others, 2010) are among the changes predicted in the next century that would affect the San Jacinto River in the area of the impoundments.

2.6.13 Comment: Region 6 has apparently made no effect to disaggregate the effects of subsidence, erosion and dredging on channel morphology.

Response: *The United States Army Corps of Engineers reported that changes in channel planform morphology due to bank erosion and shoreline breaches, etc., is beyond the ability of existing sediment transport models to simulate. However, the Corps' modeling did account for changes in morphology due to erosion and deposition. The EPA is aware of the subsidence, erosion, and dredging that has occurred in the vicinity of the site. The erosion, as occurred during the 1994 flood and in 2016 adjacent to the temporary cap, for example, is one of the contributing factors raising uncertainties about the long term integrity of a structure meant to contain dioxin waste in the San Jacinto River. Regarding dredging, or sand mining, the National Transportation Safety Board in their report on the 1994 flood linked the erosion that occurred in*

the Banana Bend area with sand mining. The EPA notes that sand mining also occurred immediately upstream and adjacent to the waste pits.

A region of major subsidence is centered on the Site. Historical subsidence of up to 10 ft between 1906 and 1979 in the vicinity of the Site has been reported by the Harris Galveston Subsidence District, Bawden et al. (2012), and others. Subsidence has been arrested by institutional controls on groundwater extraction that are in place at the regional scale. The Corps of Engineers reported that the impact of any continued subsidence would be dependent on the rate of subsidence, which is not well known and cannot be predicted with any reliability. However, subsidence, and the slow rise of sea level, would both result in slightly deeper water depths in the area, but it is not believed that these effects would be substantial enough to affect the tidal, river, and wind induced circulation in the San Jacinto River estuary (Hayter and others, 2016).

2.6.14 Comment: While Region 6 asserts that the San Jacinto River is a very dynamic system, subject to changes in size and flow paths as experienced during the 1994 storm, in fact: examination of rectified aerial photos and maps show that the 1994 storm did not change the location or alignment of the main channel of the river within 2 miles of the Northern Impoundments.

Response: *While the argument can be made that the upstream channel changes due to the 1994 flood specific to the Banana Bend area did not occur downstream at the Site because channel conditions are different, this is not to say that there were no changes in size and flow paths of the river at the Site during the flood. Net erosion of 10-12 ft in the river bed downstream of the I-10 Bridge (NTBS, 1996) suggests the erosive power of flow at the bridge and in the vicinity of the impoundments was significant. Simulation of the 1994 flood by Hayter and others using the hydrodynamic module in LTFATE predicted a maximum of 6.0 ft of scour in the reach of the San Jacinto River around and a short distance downstream of the substructure of the I-10 bridge. More recently, in 2016, about 8-feet of riverbed scour occurred immediately adjacent to the temporary cap. While this scour area was repaired by covering it with armor rock, there is little certainty that a high intensity flood or a severe hurricane would not have resulted in significantly increased scour or damage to the temporary cap.*

Hayter and others (2016) refer to "the dynamic nature of the flow regime in the SJR estuary" in their assessment of the hydrology and hydrodynamics of the river, referencing the location of the Waste Pits within the FEMA designated 100-year floodplain, susceptibility to flooding from storm surges, and vulnerability of the Site due to sea level rise. A "dynamic system" could be considered a system subject to a wide range of flooding and storm surges, and this type of activity will continue irrespective of the additional impacts of subsidence or dredging. The frequency of hurricanes along any 50-mile segment of the Texas coast is about 1 every 6 years; the annual average occurrence of a tropical storm or hurricane is about 1 per year (Roth, 1997). Hurricane Ike, which made landfall near the north end of Galveston Island as a Category 2 hurricane (wind speeds of 96-110 miles per hour) caused storm surges of 15-20 feet above normal tide levels in much of the Galveston Bay area (National Hurricane Center, 2017). Warner and Tissot (2012) conservatively estimate a sea level rise at Galveston Bay of 2.1 feet over the 21st Century, and continuously increasing risks of flooding from storm surges as the

century progresses. By this definition, the river may be considered dynamic, and becoming increasingly more so over time.

2.6.15 Comment: Changes associated with the 1994 storm consisted of erosion of high flow paths through floodplain sand mines (pits) and scour downstream from the I-10 bridge. Neither type of erosion resulting from the 1994 storm imperiled or caused erosion of the Northern Impoundments, even though there was no armored cap in place at the time; and neither type of erosion produced an avulsion [rapid abandonment of an existing river channel and creation of a new channel] in the main channel of the river. The extrapolation of rates of channel change from upstream reaches of the river (i.e., Banana Bend) to the reach immediately adjacent to the Northern Impoundments is not supported by evidence or logic.

Response: *While the argument can be made that the upstream channel changes due to the 1994 flood specific to the Banana Bend area did not occur downstream at the Site because channel conditions are different, this is not to say that there were no changes in size and flow paths of the river at the Site during the flood. Net erosion of 10-12 ft in the river bed downstream of the I-10 Bridge (NTBS, 1996) suggests the erosive power of flow at the bridge and in the vicinity of the impoundments was significant. Simulation of the 1994 flood by Hayter and others (2016) using the hydrodynamic module in LTFATE predicted a maximum of 6.0 ft of scour in the reach of the San Jacinto River around and a short distance downstream of the substructure of the I-10 bridge. More recently, in 2016, about 8-feet of riverbed scour occurred immediately adjacent to the temporary cap. While this scour area was repaired by covering it with armor rock, there is little certainty that a high intensity flood or a severe hurricane would not have resulted in significantly increased scour or damage to the temporary cap.*

2.6.16 Comment: The main channel of the river channel is stable with respect to the fluvial processes of lateral migration and avulsion and therefore cannot be characterized as "very dynamic."

Response: *It may be true that the fluvial channel of the San Jacinto River in the area of the impoundments is relatively stable. However, a tidal river is an inherently more dynamic environment than would be a more stable inland location not subject to currents, changes in stage, and the more focused effects due to flooding, storm surges, and hurricanes to which the current location of the Waste Pits is subject. An analysis of San Jacinto River channel stability based on system history does not consider projected changing conditions, such as sea level rise, that could affect system stationarity and therefore stability. Classification schemes such as those by Lagasse and others (2004), which can be used to establish channel stability, were designed to classify upland river systems. The San Jacinto River in this reach is downstream of a dam and is part of a coastal-plain estuary. As such, there are additional forces acting on the river, such as downriver releases from the dam and upriver/onshore forces such as hurricanes and storm surges, which can affect the morphology of the area in ways not accounted for in an upland river classification scheme. A 2 ft rise in sea level (Warner and Tissot, 2012) and an increase in the frequency of high intensity hurricanes due to a rise in sea surface temperatures (Knutson and others, 2010) are among the changes predicted in the next century that would affect the San Jacinto River in the area of the impoundments.*

While the argument can be made that the upstream channel changes due to the 1994 flood specific to the Banana Bend area did not occur downstream at the Site because channel conditions are different, this is not to say that there were no changes in size and flow paths of the river at the Site during the flood. Net erosion of 10-12 ft in the river bed downstream of the I-10 bridge (NTBS, 1996) suggests the erosive power of flow at the bridge and in the vicinity of the impoundments was significant. Simulation of the 1994 flood by Hayter and others (2016) using the hydrodynamic module in LTFATE predicted a maximum of 6.0 ft of scour in the reach of the San Jacinto River around and a short distance downstream of the substructure of the two I-10 bridges.

Sea level rise in the Galveston area is conservatively projected to be 2.1 feet over the 21st Century (Warner and Tissot, 2012), which will cause storm surge floods to progress further inland, and increase the frequency and intensity of flooding in the area of the impoundments. Despite being designed to withstand a 100-year flood, and in the absence of floods of this magnitude since the cap was in place, portions of the current armor cap have needed repair on an annual basis. Current models are not designed to simulate the potential combination of downstream dam releases due to flooding, onshore storm surges and flooding due to hurricanes, decreased ground stability due to saturated conditions, and the increased occurrence of higher intensity storms, making the evaluation of erosion risk in the area of the impoundments problematic.

Hayter and others (2016) refer to "the dynamic nature of the flow regime in the SJR estuary" in their assessment of the hydrology and hydrodynamics of the river, referencing the location of the Waste Pits within the FEMA designated 100-year floodplain, susceptibility to flooding from storm surges, and vulnerability of the Site due to sea level rise. A "dynamic system" could be considered a system subject to a wide range of flooding and storm surges, and this type of activity will continue irrespective of the additional impacts of subsidence or dredging.

2.6.18 Comment: Past "changes" in the river identified by Region 6 were highly influenced by conditions that no longer exist (e.g., subsidence and dredging), so there is no credible basis for Region 6's assertion that such "changes" will continue into the future.

Response: *Changes in the river are influenced by the location of the Waste Pits within the FEMA designated 100-year floodplain, susceptibility to flooding from storm surges, and vulnerability of the Site due to sea level rise. The system is subject to a wide range of flooding and storm surges, and this type of activity will continue irrespective of the additional impacts of subsidence or dredging.*

2.6.19 Comment: Future storm events and potential climate changes will push the river towards adapting to future flows by erosion of the weakest portions of the river's channel, the soft-fine-grained sediments and banks, rather than a highly armored structure, such as the Alternative 3aN enhanced cap.

Response: *Although the soft-grained sediments may be the first area of the river to erode during an extreme event, this does not preclude these changes from also compromising the cap. For example, the evaluation and modelling performed by the Corps of Engineers (Hayter and*

others, 2016) showed that the cap with additional upgrades (Alternative 3N), in addition to the 2012 upgrades, was still predicted to incur extensive erosion over 80 percent of the cap during a hurricane scenario. The Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.

2.6.20 Comment: Tools (including models) exist that could be used to evaluate the potential for the kind of event that Region 6 posits might occur. For example, there are morphodynamic models that can be used to assess meander migration and existing 2-dimensional hydrodynamic models and their output can be used to assess channel boundary erosion potential during extreme events. There are also tools that can be used to address model uncertainty. ERDC, the section of the US Army Corps of Engineers that evaluated the remedial alternatives for Region 6, has staff with specific expertise in such assessments.

***Response**: The comment is correct that a variety of models could be used to test potential effects to specific areas of the stream channel or impoundments with the application of specific stress conditions. However, the complex way in which the effects of these individual stresses interact and propagate through the river system in the area of the impoundments cannot be simulated with existing models. The models suggested as candidates (HEC RAS 5.0 with BSTEM and the morphodynamic meander models of Langendoen and others (2015 and 2016)) were designed to model upland river systems. The need to simulate scenarios in a river downstream of a reservoir and in immediate contact with a tidal estuary introduces factors into the analysis not accounted for in these models. Also, what cannot be accurately predicted are the conditions that the impoundments and channels will be subjected to, given the need to secure the impoundments for the next 500 years. The impoundments are currently located in a tidal river, in an industrial area, which is also seeing increases in population – with concurrent needs for increased infrastructure and municipal water supplies. Climate models predict an increase in the intensity of tropical cyclones and hurricanes in the Gulf, meaning greater risk of flooding and storm surges. Accurately evaluating the uncertainty of model predictions would be problematic given uncertainties in long-term future conditions.*

2.6.21 Comment: If Region 6 selects its preferred remedy largely on the basis of the possibility of future channel migration, that would suggest that every other chemical plant, manufacturing facility, or hazardous waste storage location along the San Jacinto River and Houston Ship Channel could be held to this standard as well.

***Response:** A remedy selection is not based on channel migration or any other single factor; instead the selection is based on EPA's consideration of the nine Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA") criteria, including overall protection of human health and the environment; compliance with applicable or relevant*

and appropriate standards; long-term effectiveness and permanence; reduction of toxicity, mobility or volume; short-term effectiveness; implementability; cost; state acceptance; and community acceptance. The statement that any decision for the site would also apply to other manufacturing facilities, chemical plants, etc., is purely speculative; the requirements for these other facilities would depend on the applicable law, each site's characteristics and risks, what chemicals are potential threats to the environment, etc.

2.6.22 Comment: Should Region 6 not select Alternative 3aN, it should defer selecting a remedy until a full geomorphic evaluation is completed to assess the potential for the configuration of the river to change abruptly, and to evaluate whether the Alternative 3aN cap includes or may be modified to include adequate safeguards against changes in the river channel if this is determined to be a real issue.

Response: *The USGS performed a review of the geomorphic characteristics of the San Jacinto River based on review of historic document. However, the EPA does not agree that it would be appropriate to delay completing the final remedial action for the site to allow completion of additional studies. While a variety of models could be used to test potential effects to specific areas of the stream channel or impoundments with the application of specific stress conditions, the complex way in which the effects of these individual stresses interact and propagate through the river system in the area of the impoundments cannot be reliably simulated with existing models. Models designed to model upland river systems do not simulate scenarios in a river downstream of a reservoir and in immediate contact with a tidal estuary. Also, what can't be accurately predicted are the conditions that the impoundments and channels will be subjected to in the future given the need to secure the impoundments for the long term.*

Regarding the appropriateness of Alternative 3aN, the Corps of Engineers performed a more recent model simulation to investigate the performance of the upgraded cap, Alternative 3aN. The results of the Alternative 3aN modeling showed that erosion of the cap would most likely occur over most of the cap during the extreme storm event modeled. This modeling considered the wave impacts from a Category 2 hurricane (Hurricane Ike), however, even stronger hurricanes capable of achieving Category 3, 4, or 5 levels are possible during the long term that the dioxin would remain toxic. The removal of the waste material will provide a long-term solution to protect the community, eliminate the potential for a release to the environment, and prevent the Site from becoming a large contaminated sediment site.